

NATIONAL AIRCRAFT SHOW NUMBER

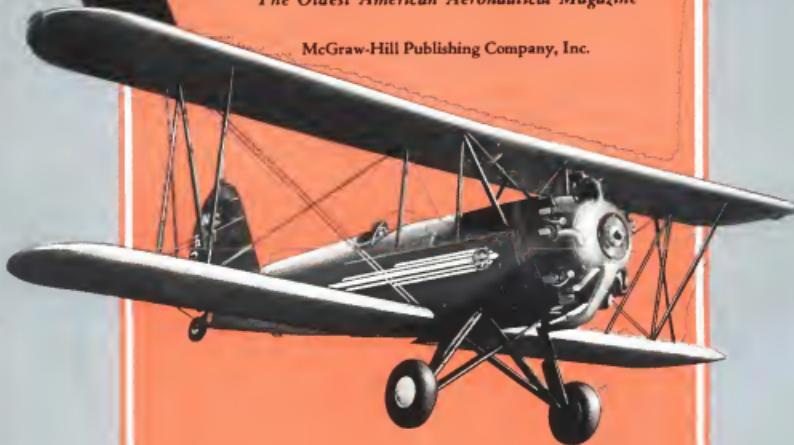
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APRIL, 1932

AVIATION

The Oldest American Aeronautical Magazine

McGraw-Hill Publishing Company, Inc.



See these new planes . . . **CURTISS-WRIGHT EXHIBIT**

NATIONAL AIRCRAFT SHOW

HERE are the new Curtiss-Wright Sport Planes—the outstanding values of 1932. They have racy lines, rugged construction and they are extremely fast.

The Travel Air Sport cruises at 115, with a top speed of 135 m.p.h. The de luxe Speedwing steps along at 187 m.p.h.

See these new ships at the Curtiss-Wright Exhibit, National Aircraft Show, before considering the purchase of any other plane. Into their development Curtiss-Wright has built the rugged quality and value which enabled this organization to sell 38% of all the commercial planes bought last year.

Curtiss-Wright Bases and Authorized Dealers are located from coast to coast—the nation's leading aircraft sales organization. Write for a complete list of exceptional plane values.

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TRAVEL AIR SPEEDWING





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Into them are built long experience, an enthusiasm for making "the best," the devotion of craftsmen, and the vast engineering resources and technical skill of the great Bendix organization. Pilots, operating officials, manufacturers all know that Pioneer Instruments are *right* because Pioneer builds them.

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The Oliver detection decomposed Magnesia

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The
PILGRIM
100-A
TRANSPORT AIRPLANE



The PILGRIM 100-A, ten place transport airplane, is a complete transport unit, ready for immediate service and fully equipped with two-way radio telephone, and radio beacon receiver . . . full eight flying equipment . . . toilet and lavatory . . . heating and ventilating system . . . 47 cubic foot mail compartment . . . 23 cubic feet of baggage compartments . . . all incorporated into the design and built in at the factory for greatest satisfaction.

The many advantages offered by these up-to-date developments are fully described in illustrated folder which will be sent upon request.

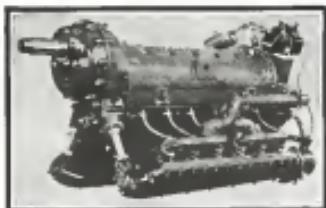
The PILGRIM Airplane and RANGER Engines will be displayed at the National Aircraft Show in Detroit, April 2nd to 10th.

AMERICAN AIRPLANE & ENGINE CORPORATION

Manufacturing Division of the Aviation Corporation

FARMINGDALE, L. I., N. Y.

Manufacturers of PILGRIM AIRPLANES and RANGER Engines



RANGER V-12 90° BEARDED and SUPERCHARGED 200 H.P.

The
RANGER
INVERTED AIRCOOLED
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ON THE AIRWAYS TODAY
as on the highways !
for the last 30 years !



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SAFETY... SPEED... and Reliability



... the keynote of

BELLANCA 1932 TRANSPORT PLANES

THE Bellanca planes on exhibition at the National Aircraft Show in Detroit are further evidence that Bellanca engineers understand the problems of today's transport business.

The new Airbus and Skymotor models at the Show are fast planes! Their speeds are higher than the requirements of the airline operator of today. Bellanca executives express complete satisfaction with Bellanca planes for speed operations. These can be unfeared, as well, however, by the many other factors that stand back of the Bellanca reputation.

There are such considerations, for example, as reliability and safety. The remarkable, established efficacy of Bellanca planes—that structural soundness and new features of streamlining—all enter into the economy with which they are invariably acquired. Bellanca economy goes further than first cost; it carries right through the life of the plane, a factor of prime importance to the airlines of today.

THE AIRBUS TRANSPORT

Twelve place transport (pilot, one passenger required).

Wings of Bellanca, stackable.

Seas, ground, landing, deck, ground, seaplane or ready ground.

Windshield, one large.

Cabin streamer and air speed indicator visible to passengers.

Black design fuselage base, woodlike.

Complete radio facilities.

THE SKYMASTER TRANSPORT

Six place seats.

Upheaved in Taireldor, stackable.

Large baggage compartment, accomodating both air mail as well as weight limits for radio.

Night flying equipment.

This plane can carry more cargo a greater high-speed transport.

• ALL BELLANCA AIRPLANES ARE EQUIPPED WITH ELECTRIC STARTER AND FULL COMPLEMENT OF INSTRUMENTS.

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Precision Bearings



Some P. & W. Performance records in which **Norma-Hoffmann** bearings participated:—Eminent Arctic Search, world's altitude record for land planes and seaplanes; Biplane Speedster, three world's records for altitude and speed with pay loads; Four and Fifty, four record runs—*the world*—that.

You are invited to call at Booths 42-44, Orieille Wright Airway, Detroit Aircraft Show

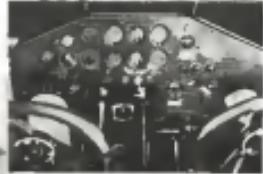


NORMA-HOFFMANN
PRECISION BEARINGS
BALL, ROLLER AND THRUST

Right: The Fokker D.20 with the inverted three-blader. Below: An American biplane with a wooden fuselage and an Hispano-Suiza engine.



Right: Recent General Electric aircraft engine to be exhibited in the Hall of Progress. The propeller is powered with a Wasp Junior.



Left: World's fastest all-metal all-weather pursuit plane—the Boeing Model 80-802 of all-metal monocoque construction.



Si-112A engine embodies a new head design with improved valve action and is the standard power plant.

The latest model of the Pioneers with continental engine is to be shown by Aeromarine at the show. This model is a three-blade monoplane having a tail of unusual design, employing an aluminum alloy bottom and fabric covering for the sides and top with a welded steel tube structure.

The American airplane and Engine Company will show the Pioneers 180-A transport plane, described in the November issue of *Airnews* (page 684).

One representative of each of the major aircraft manufacturers will be present, the Fairchild, Stearman, Ryan and Air Bus, will constitute the display of the Bellanca Aircraft Corporation. The already high efficiency of the Bellanca has been increased and the parasite resistance has been decreased, particularly in the Fairchild and Stearman models, through the introduction of a new low drag design of fuselage fairings.

Five models will be displayed by the Bell Aircraft Corporation, featuring the Bellanca 14-77, the Bellanca 14-78, as well as the Fairchild 26. The final cushion has been designed particularly for aerial service. A conventional open biplane with tandem cockpit arrangement,

employing installation of an automatic pilot control mechanism, is to be introduced to the industry by the Bell Aircraft Corporation, Small, Ind.

Four commercial planes will be shown by the Curtiss-Wright Corporation through its subsidiary, the Fairchild Aviation Company. Two of these are the Fairchild 26 and the Fairchild 28, a three-blade Springfield, with a 280 hp Whitcomb engine, the other the 280 hp Springfield with a 300 hp Wasp Junior. The "Duck" light amphibian, powered with the 80-hp Warner engine and a Super Speedwing will be shown.

In a special effort to meet the needs of the non-professional flier, the Fairchild Aviation Corporation has developed a high wing cabin monoplane, with roll by soft surface arrangement, and ample width of cockpit for such an arrangement. The aircraft is well proportioned and has exceptionally clean lines. It is designated "Fairchild 28" and powered with the American Cirrus inverted engine.



Above: Increased power and greater range are features of the Fairchild 26.

With the 80-hp Warner engine and a Super Speedwing will be shown.

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Above: Greater fuel economy and increased visibility are features of the Fairchild 26.



Above: Biplane status is preserved in sufficient measure in the Waco Model 8, a monocoque aircraft which features a side-by-side cockpit. Left: A monoplane using monoplane planing. Overall: Convair's Allis monoplane.



similar design designation "28" is nearly like that introduced last year, is also scheduled for exhibit.

A study of the service requirements of the non-professional flier has made the determining factor in aircraft design made by the Great Lakes Aircraft Corporation in the Model Trainer. Large cockpit opening, enlarged windshields, reflection of luggage compartments, cooling radiators for greater engine accessibility, are the main design features.

Elmwood & Hoskins, Designers have redesigned cockpit for the Park & Ryerson Speedster and will have a place at the show.

An entirely new contribution to the sportplane market has been made by Mr. W. H. Knobell. The plane is a single-bay low wing monoplane with a unique main landing gear which can be used and sold by side section for the two passengers. Distrubutor will be distant from the factory, and a rare plane plan requires no insurance but less insurance. The engine is a 100-hp Knobell K-1.

The Monocoupe Corporation will have four of the well-known two-place cabin monoplanes powered by Leimberg, Kinner, Vultee and Warner engines and will display, as a feature of the exhibit, a roll of monoplane used by the Monocoupe in various competitions of recent months. The aircraft is to be exhibited by the Knobell Knobler Aircraft Company. One will be the V-85 folding wing racing monoplane, with sixes the Gause & Lander engine.

The Stratocraft Corporation will display three models, emphasizing the new model R Junior and the Model T Aeroliner. The Model R is an 185-hp version of the famous Stratocraft, and the Model "T" is a transport of 12-passenger capacity and faster and more

comfortable than the present Aeroliner. The power plant is the Lycoming engine. Improved visibility and general ease of use are exhibited in the Continental C-90, a light monoplane which will be displayed by the Taylor Aircraft Company. The model to be shown is the improved design brought out late last fall.

Several of the amateur demands of non-professional owners are fulfilled in the Waco Model 8 biplane. This is the first to be available in a Continental, Warner, Scarff, and other known models. Special importance to the non-professional owner are the one-piece convertible winter top and the 100-hp mass balance compartment shield of the front seat, which has been provided to protect the passenger from the elements.

The exhibit of the Eastern Aircraft & Transport Corporation will include a Herring Vought Corsair, a Waco Junior 5-39 Scorchy, and a Waco Boring pursuit plane. It is possible that the Laird Sabre 2, with which Major James Doolittle won the transcontinental air race, will be included. The Boeing P-26E Model 27-124E is exhibited by the U. S. Army Air Corps as the fastest all-weather pursuit plane in the world. It is a biplane type, different from the previous 22 models in that it has no all-moving tailplane and supercharged version of the Ranger engine. The power plants develop 200 and 2150 horsepower at 2000 and 340 hp at 1200 rpm respectively.

The complete line of engines comprising three, five, seven and nine-cylinder units of the Airplane & Engine Company are to be on display. Through the medium of increased bore the Continental Aircraft Engines

Engines

An interesting series of inverted in line all-cylinder engines will be introduced by the American Airplane & Engine Corporation. This group includes engines in a wide power range, all of which are of the cylinder-in-line design with intercoolers and supercharged versions of the Ranger engine. The power plants develop 200 and 2150 horsepower at 2000 and 340 hp at 1200 rpm respectively.

The complete line of engines comprising three, five, seven and nine-cylinder units of the Airplane & Engine Company are to be on display. Through the medium of increased bore the Continental Aircraft Engines



Left: Biplane status is preserved in sufficient measure in the Waco Model 8, a monocoque aircraft which features a side-by-side cockpit. Overall: Convair's Allis monoplane.

Company has stepped up the output of the familiar A-70 model to 210 hp, representing an increase of 45 hp for a 25 lb. increase in weight and lowering the specific weight down to 1.61 lb. per hp. The new model which is known as the R-80 is the result of a complete redesign of all parts, including the placement of oil tank and the installation of a new carburetor, to correct the same as those of the A-70.

The Gardner Diesel, was shown for the first time last year at Detroit, is now in commercial production. A 240 hp unit will be displayed together with a complete line of Gardner products. The engine is said completely described on page 399 of that issue.

Standard 170-hp seven-cylinder engine, 55-hp three-cylinder engine, and a sleeve-contains parts will constitute the exhibit of the Fahey Engine Company.

Four radial power plants and a number of representative parts will be shown by the Kaiser Aircraft Motor Corporation. Considerable interest is expected to center around the R-5, a new 100-hp engine which weighs only 110 lb., at 1.15 lb. per hp. The other models to be shown are the familiar K-5 130 hp., B-5, 120 hp., and C-5, 210 hp.

To meet the demand for increased performance in transport plane designs Pratt & Whitney Aircraft Company has brought about a new line of engine components represented in its newest output and lower specific weight. As a series, the engines all weigh less than 14 lb. per hp. The Pratt & Whitney display will be centered around the Wasp Junior. The distinctive Wasp and the ground support equipment will be shown.

Included in the exhibit of the Wright Aeronautical Corporation which will serve a portion of the Curtis-Wright span, will be a new Cylind. 305 engine with the E-type head, and the latest model of the Whirlwind, Challenger, and Gypsy engines. The new components show standard improvements on all engines, and the high compression piston of the new 400 hp. Whirlwind will be among the parts in the exhibit.

A newly-designed cylinder head has a new model of higher compression ratio and will be a feature of the exhibit of the Curtiss-Wright Corporation. One of the engines will be radio-shielded.

The development of Bellanca monoplanes in which a non-reflexing rudder was used was last year will be the feature of the packed exhibit.

In addition to the 30 and 110-hp engines developed by the Warner Aircraft Corporation, a 150-hp unit is to be shown at Detroit.

Accessories

Products representing a large group of research, some of them entirely new will be presented to the accessories ex-

hibit of Textron Aviation Corporation. Most striking novel offerings will be those of the Eclipse Division, a mechanically pitch propeller hub and an automatic supercharger. The pitch changing feature of the propeller hub is extremely simple, the pitch being changed to move automatically within the hub against spring pressure. The weight of a complete propeller, including hub is 7 lb. more than that of an ordinary metal propeller. The supercharger follows conventional centrifugal design, but has three new features—constant impeller, a controllable overspeed



Textron. An unique feature of this has been a difficult or changing the hub in the conventional manner with a minimum of tools. The Eclipse Division, however, can be easily disassembled and reassembled.



and clutch, and wind-speed regulator. New carburetors, most of them designed for large engines now in the experimental stage, will be offered by the Curtiss-Wright Corporation. A hydraulic brake, formerly exclusive with the Ford plane, but now adapted to all transport and cargo planes, found standard sets of wheels embodying a high degree of simplicity in hub adjustments, will be featured by the Glenn L. Martin Company. Instruments and other equipment will be displayed by Pioner, Penn, and Delta and wood propellers for large engines and laboratory insulation will constitute the major portion of the exhibit of the American Propeller Company.

Gasoline, alcohol, paraffin, cladding, instruments parts and accessories and insulation will be shown by the Curtiss-Wright Corporation. One of the engines will be radio-shielded.

The development of Bellanca monoplanes in which a non-reflexing rudder was used was last year will be the feature of the packed exhibit.

A cutaway section of a standardised four model will be exhibited by the Edo Aircraft Corporation together with a display of the company's new rudderless design by dual coupling for all four.

The complete line of instruments manufactured by the Elgin National

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Wash Company will be available for inspection. Radial engine cowling and ground hand carts, and other parts will be shown by the B&H Aircraft Streamline Company and a wheel parts table, a device which makes wheel parts adjustable to any position necessary to conform with landing wheel clearance as it is introduced. Threading equipment and tools, including presses, tools, tools, etc., and service tools of the most recent design will be shown by the Imperial Brass Manufacturing Company.

Parachutes and parachute equipment of newest design will be exhibited in the display of the Army Air Corps Command and the Federal Parachute and Equipment Company.

A very complete line of hollow steel propellers, embodying two-sided design and diameters ranging from 8 to 10 ft. will constitute the exhibit of the Douglas Screw & Bolt Corporation. The Douglas single pitch propeller hub which makes it possible to change the pitch of an engine easily and quickly without disassembly of the propeller, will be one of the features of the exhibit.

For the first time at any aircraft show, a complete line of oil-eliminating devices will be offered by the Stinson Motor Corporation. This display should be particularly interesting to operators of the transport aircraft.

A new type of fuel line testing machine, eliminating the necessity of using the olive jar, is to be shown by the Sky Specifiers Corporation.

In a unique, the use of which will be the first in aircraft maintenance and in fighter planes in which Sky Specifiers equipment was used, the maintenance of the self-tightening and de-tensioning gear will display this device in actual operation as far as this is possible in the limitations of the exhibition.

An operating demonstration of the Deltastand fuel injection equipment will be included in the Warner exhibit.

The Allis-Chalmers division, including instruments parts and accessories and insulation will be shown by the Curtiss-Wright Corporation. The new directly-operated controllable pitch propeller will also be on exhibit.

The new General Electric plane, a flying laboratory for purposes of testing and testing will be a major feature of the General Electric exhibit, and a complete line of instruments, superchargers, landing lights, ball bearing control panels, will be shown.

The Westinghouse Electric & Mains Company will show rotating wheels, beams, landing field floodlights, ceiling projectors, rotating beams, wind and rain gauge driven gun mount, seismic patrols, fire loads, and many weather devices.

Materials, tools, equipment

A model plant manufacturing plant showing machinery in operation and quarry boats with operators, will be a feature of the Harry Brothers exhibit. The company will also exhibit the model line of Barry quarry materials.

An extensive presentation of castings and other fabricated parts of magnesium alloy will be arranged by the Elgin National Company.

Samples of the 100 and 2000, as well as 1000 rpm, models of the 1000 rpm, a 1000 rpm, will be exhibited by the Hudson Manufacturing Corporation. A number of interesting applications of this material will be arranged in the exhibit. Wire, wire rods, insulated wire and cable for aircraft use will be shown by John A. Redding's Sons Company.

Specimens of aircraft-welded airplane parts, Army National Control, and Army D-3 welding and cutting equipment and supplies will be shown by the Air Reduction Sales Company of New York. Precision aircraft engineering tools, including a new line of angular stocks and quickly adjuster datum assembly of the propeller, will be one of the features of the exhibit.

For the first time at any aircraft show, a complete line of oil-eliminating devices will be offered by the Stinson Motor Corporation. This display should be particularly interesting to operators of the transport aircraft. A new type of fuel line testing machine, eliminating the necessity of using the olive jar, is to be shown by the Sky Specifiers Corporation.

In a unique, the use of which will be the first in aircraft maintenance and in fighter planes in which Sky Specifiers equipment was used, the maintenance of the self-tightening and de-tensioning gear will display this device in actual operation as far as this is possible in the limitations of the exhibition.

An operating demonstration of the Deltastand fuel injection equipment will be included in the Warner exhibit.

The accuracy section of the United Aircraft and Transport exhibit will be devoted to the products of the Blairstown Steel and Propeller Company. These include the use of a new type of stay adjustable blade propeller and the controllable pitch propeller shown last year.

The new General Electric plane, a flying laboratory for purposes of testing and testing will be a major feature of the General Electric exhibit, and a complete line of instruments, superchargers, landing lights, ball bearing control panels, will be shown.

The Westinghouse Electric & Mains Company will show rotating wheels, beams, landing field floodlights, ceiling projectors, rotating beams, wind and rain gauge driven gun mount, seismic patrols, fire loads, and many weather devices.

special designs for submarine aircraft use, ball, roller, and sleeve bearings, and a complete line of aircraft parts to those for astronomical applications, are to be shown by the Normal-Hoffman Company. A number of interesting devices illustrating the uses of roller bearings of the familiar Timken type will be set up on the booth of that company.

Advertisement of precision external and square surface material by rods with unusual assemblies will be shown by the Stewart Brothers and Manufacturing Company.

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An interesting assembly of drop forgings are to be featured by the Wyman-Gordon Company.

Transport equipment

Attractive exhibits are planned by several of the major transport operators in an effort to familiarize the visiting public with their service. Transoceanic Air Lines Corporation will display a large illuminated sign showing the routes over which its passenger, mail, and express services operate, as well as the names of the cities served.

New maintenance procedures and special servicing equipment will feature the sales and service organizations' exhibit in the same space.

An illuminated road map of the country, with its cities, towns, and roads, and its routes in lighting colors will feature the exhibit of the United Air Lines. The display will also include a partial visualization of air transport of the past and present, and descriptive data on all of the United Air Lines subsidiaries will be available.

Stinson Specifications Board, will furnish a booth with telephone service, and a number of other information sources for visitors, in addition to an interesting display of aviation fuels and oils. "Old Man Koolaid," the advertising young oilman of oil consumers, will be on duty throughout the show in the Koolaid space. The Shell and Texaco companies will also be represented at the show.

The industry's executives classify their problems

Keystones of policy for 1932



William B. Marston

Aviation progress on aviation profits

By **William B. Marston**
President, Marston-Western Corporation

EVERYONE with any knowledge of conditions that can exist in the aeronautical industry must appreciate that when gauged by usual standards it has not been a tremendous success in the past several years. Of course, considerable progress has been made in the general category of development. The industry has developed a system of air transportation, as well as engineering and research development in planes, engines and accessories. Under the circumstances, some outstanding achievements have been accomplished. We have now reached a point in the period of development that, in my opinion, requires the development of some sound cooperative effort in development activities, both in technical, as well as the business problems, with which we are faced.

Today the industry, both manufacturing and distribution, is in a position almost entirely on the federal government for its present existence and future welfare. The government is entirely justified in rendering assistance; first, because it is essential that the United States have adequate air power as a means of defense. *Continued on page 411*

Air transport faces a new era

By **William B. Marston**
President, Marston-Western Corporation

Americans are transports. Since last year carried as many passengers as in 1926. The volume of mail was just as great. The way is well marked for sharp reduced traffic on the air freight and other passenger carriers. Such an accomplishment seems startling.

Measured by the general partake of business in the past year, it might have been expected that the air transport industry would have had a decided increase in traffic. As the narrow gauge of success we might have suggested it would have been but weak.

But that was not the case. Instead of falling off, traffic was maintained on a level with the previous year. Obviously, that is an indication which the industry well can be proud. It is fair to assume that if business generally had been normal air travel would have again shown an increase in 1931.

As far as operations were concerned, therefore, the aeronautics industry made a record achievement in 1931. The same was not true of the manufacturing plane of the industry.

The volume of business done by the plane and engine manufacturers last year fell considerably below that of previous years. This was to have been anticipated. Many factors entered into the situation.

One of the most (Continued on page 411)



P. G. Johnston

Air travel, on its own record

By **P. G. Johnston**
President, United Air Lines

United Air Lines has issued to every passenger a luggage card carrying the passenger's record for his expression of the flight and to make suggestions for improvement of the service. From these cards we find how important it is to inform the public with the safety of flight.

Mostly five per cent of the passengers are not only released as frequent flyers by the proper observance of safety measures but they become the best salesman for future progress. The industry has a great deal to offer in this connection. We believe that at least 35 per cent of the new passengers we have carried on United Air Lines in the last six months were induced to travel because some passenger had convinced them of the desirability and safety of flight. This holds equally for the other major operators of air lines. One commentator of a friend of ours said: "Had not more frequently than any other check on the card."

For every part of the flying on our transport system, at least, is done by business men, many of whom are executives. They are not the type to fly for the romance of the trip, but they do so because they feel the airplane saves time and is a value. (Continued on page 411)



George W. Witte

The aircraft industry faces many problems. As an endeavor to find out how they look and how they rank in relative importance to the men who have to take the lead in solving them, we invited some of the leaders in the field to contribute brief statements for publication in *AVIATION*. Each of them was asked to submit a specific question for discussion, and in no case was a definite subject assigned. In a few instances the shortness of the time and pressure of duties prevented compliance with our request. One of the most interesting results of this compilation is the evidence it furnishes of the thought that is being given to the problem of selling the public on the safety of flight. Several of the contributions disclosed open that at the present time, The dimensions of the private market, and the interpretations of the very encouraging record of air transport through the depression period, are also of great interest.



G. M. Bellanca

The public and the safety of flight

By **G. M. Bellanca**
President, Bellanca Aircraft Corporation

AIRCRAFT manufacturers can do much constructive work in the direction of aiding and increasing sales by continuing to lead public opinion and in ensuring that safety is the wisest, letting the public know that safe planes are being built, and by strenuously opposing the use of unsafe planes. The public does a great deal to aid this movement by frequent publication of the findings drawn without exception. The constant placing before the public of such data will help to show the present status of air travel and to increase and maintain the industry in its travel field.

The manufacturer's part is to keep on developing safety through refined design and new safety devices, the sales manager doing this in so far as to keep an inexpensive airplane, even if they should cost a little more. In order to maintain an airplane of this type of airplane, it is necessary to use every design of the same type, we ought to concentrate on very few types, using all of our present day knowledge and skill, and by this concentration reduce the cost of manufacturing.

Safety is the first thing we have to demonstrate and prove to the public, and by doing this the public will be more convinced of the soundness of flying. At the present time, the public is almost safety-conscious as regards aeronautics, and it takes just a little time to establish full confidence in flying. However, the fact that the public is not quite as safety-conscious as it should be, (Continued on page 411)

What's wrong with the aviation business?

By **B. D. DeWeese**
*Editor, *Aviation Week* Division, Standard Oil Company*

ASIDE from the general troubles which periodically all industries are suffering, each one has its specific difficulties and it is certain that concentrated distribution is the major problem to solve. "We now have designs and build worthy planes at reasonable cost," says one manufacturer. "The question is, can we sell them at a reasonable price so there is no such thing as an airplane dealer or distributor, and direct selling is very hard."

What is the flying field man, he was asked. "Well, he's broke and doesn't know how to get out of it." "He hasn't enough money from 1922 and 1928 to re-adjusted his sights and give up now. He is still working for another living."

Distribution is always the hardest task we should not be too quick to blame the public for not buying more than any of us not only in making planes but also in convincing the general public that they by far have now become a safe and speedy means of going places and getting back and that the airplane has now been polished to a high standard of comfort and safety. The public does a great deal to aid this movement by frequent publication of the findings drawn without exception. The constant placing before the public of such data will help to show the present status of air travel and to increase and maintain the industry in its travel field.

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It is always refreshing and sometimes profitable to stray from the beaten path of conventional development in an industrial field and to visualize a future product. Such exercises are particularly valuable if one looks ahead without losing sight of the fundamental economics of the situation. In this type of analysis, and as the application of popular psychology to the development of the products of industry, Mr. Scott is a past master. Despite his previsions into the future, he never forgets his oft-repeated slogan that "A commercial airplane is a plane that will support itself in the air financially as well as mechanically."

Planes of yesterday

By William B. Scott

ILLUSTRATIONS BY THE AUTHOR

*Oh where are the planes of Yesterday?
The wind has blown them all away!
Or is it that they, could not fly?
Oh where are the planes of Yesterday?*

THAT'S poetic, eh? It is somewhat Villonian. It has rhyme and reason, and the proper number of feet with the usual Obscurian environment, and probably I know that it was poetry. It has some-
thing to do with us, I suppose, for we have all heard before—sort of paragraphs of something that sounds like this: sometimes that we take and make over and over it now. That is what the poet means, I suppose, who in our know-
ledge along the beaten path of poetry. They each wrote—so they enjoyed, which is by way of estab-
lishing that I pleased to be so.

And if there is so with poets as we with other authors and inventors, so over! I may be perdoned—airplane designers and business men (7).

The airplane industry, or, business, as I prefer to call our own definition, depending on which branch of the industry it is, is not the greatest nor the one that ever has been, or any industry has since the beginnings of transportation. However,

There was a way who built a house upon the sand. And the sand descended and the floods came and the wind blew and beat upon that house and it did not stand and will be till Hell freezes over because the house that built it had trans-

enough to know what he was doing. Cops two roofs to build a house upon a rock.

But this was a Prodigal Son so prodigal that he refused to be stand-
ed up by the rock, and so he built the elephant upon sand and made more than 4,000-600 semesters within two years.

A group that knew all about clouds from 200 years experience turned out to be the inventors of the electric clock. Now, as far as I know, how clouds are made and carry out how they were made on Custer's time.

A group of pilots, color-
ful characters, leaving Harvard University, started a fast-foods and an electric fan, built just the right kind of an airplane for my pleasure should be built.

These weirdnesses are like that.

Let me have any of them now for the bringing of a song—
let me suggest the "St. Louis Blues" or "Dixie God can Make a Tom-tom in Airplane."

Some of the engineers will be glad to play an automobile in the air—
The best drivers to a lot of the un-
captured data which have left the airplane industry not as painstaken for a lot of us thought-out planes, half-
heartedly carried out, and with two
eyes on the stock market and one half
an eye on the main issue.

Therefore, in all wisdom, our mistakes enough to know where we left off
can't wait at the Disney as entirely at



One man who knows his job is better than the best committee of experts that ever stepped into the same room. (Note: Gulliver's elephant here is ruled by a bunch of cut-throats for sleeky leaders.)

and learned to build solid foundations for basic structures in industry on foundations shaking as sand, and sand as treacherous. The listed call us names—
and they are still there.

There was a house program, garage and it was from the need to
get out of the sand that the man
is me and we generators. Woe to
my business which the Devil left us
away from us?

No one was able to explain how it was
the Devil had taken away that man's
goods when he himself had built such
an air castle to where it would
not be able to stand. "We it is not" Since
he started following there has been no

AVIATION April, 1932

built for our own adventur-
ous—nor is there a Santa
Claus to give us assistance
from the material put into our hands.

Finally, the old type
plane is dead.

The plane is now ex-
pensive and can't earn a
profit. Little planes are
too complicated and flimsy
and have not the slightest
 appeal to the public that
wants to fly around there
plane is not for me.

The passenger who comes to your
factory is a "trade-up-model-Telco-
first-payment" type. He has no money
and no house as he wouldn't be ap-
pealing you as a cheap huck. Even
if you had what he wants—rather
what he needs—he would not have
and has no market, for this one has
no money and wants to take it out as
trade. He is enthusiastic and willing
to carry water for the elephant but he
knows nothing about it when elephant.

Let the industry devi-
tates that the
elephant is not big enough to write
your name on.

By the way, the long-paved
market which is vastly different from
past champions, but low price
and quality can only be had by volume of
sales resulting from volume of decreased

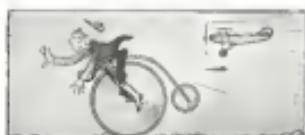
You know what the colored public
could easily afford, for it would
not be a bad idea to have a
doghouse where he could be
done to know where he ends. Indeed
we have learned to the half-baked third
colored who wants to be a Leader
and get his name in the papers who
comes around and offers unbiased and
equally worthless advice. In addition
to the doghouse.

Places want appeal to people.

They must attract the market that is
able to buy and maintain.

They must satisfy the market—or
they won't let the men fly.

The art of flying contraptions as industry
to stop the old type snafu'dy contraptions
and snafu'dy materials and certain un-
satisfactory and various un-
satisfactory, to these axes the dimensions
and noise and grease of the flying
machine, and produce air vehicles that



What would you say if a bicycle manufacturer starting to build high bicycles when safety's on the ball?



What would you think if the designer of a ship put the propeller in front to blow all the water back over the hull to impede its own progress?

of a ship put the propeller
in front to blow all the
water back over the hull to
impede its own progress?

What would you say if a
bicycle manufacturer start-
ing to build high bicycles
when safety's on the ball?

What would you say if
Gulliver had to put his
house out in the water instead
of sending the ship off?

What if Ford started
building cars with sloped
sides and put an open
window on the side of
the smaller, etc., etc., etc.—[See the specifica-
tions of any plane never sleep
plane—and never say so cheap.]

Short. This article was written at the
request of the editor, with the specific
intention that it should stir up the social
consciousness of the public, the purpose
of which was to call more and more of
the people we are now facing with the
old type elephant.

The commercial and transport air-
plane business will soon be an airplane
which can earn a dividend. As far as
the private owner is concerned, the
dealing is still awaiting an airplane
which can be sold.

In the transport field there is but one
answer, and that is the building of a
commercial airplane on the defenses I
gave years ago when we built the first
Liberty-engined transport for our first
passenger service, and that is that "a
commercial airplane is a plane that will
anywhere in the air financially as
well as mechanically."

That new plane

That new plane may not come from
the old airplane industry. It looks as
though a certain motor car man with
a much and most certain brains might
know so little about what the experts
know that he should be new.

Secondly, hear tell that it can't be
done below the pass and does it and
spoil all new set sleek.

What then can we do? What is in
store?

What would you think of a steamship
which was never propellered? What
say for a transatlantic expressman
that did not have capacity nor speed enough
to even approach a divided? (How
about that air transport?)

What would you think if the designer



What would you say if the inventor of the blade started to build the ball?

owner airplane is there anywhere that you will pay your men to go to have the engine repaired, money lost? Where is the plane you went with diamonds and waves and sons in leathers to fly in? The answer is—Where?

We could make a cheap automobile to sell for a hundred dollars and ten takers—now we have a car that costs four thousand dollars, no stories to tell with cloth and paint, and think with golden windows and wire controls. This would be very cheap to build but who would be fool enough to buy one. People know quality then knew strength, they knew materials and workmanship and they knew appearance. We have been told the name of places where the autoists buy a dozen cars and build one but they don't build it well and because they did not sell, have said that was no excuse because

Your prospect is the man who has money enough, not only to buy, but to support an engine.

The man who can afford to buy would not have said this money. He is interested perhaps in seeing some one thinking competitor of his who is not some of that square but, he is not interested in selling and certainly not interested in buying. If he would buy, he would be in the same position as the autoists, who are the ones who are going to buy, whether John Public buys or not. Until we build a plane that the wives look at and say, "You can fly, in that and I will go with you," we have nothing to market.

Failure needed

Until there is appeal enough in this automobile as a vehicle—not as a field—for a large public to buy, it will never be lawed.

The only way you will ever get quality and low price in through volume. The coupled with the need for the largest possible engineering. This precludes the use of all gadgets, "fads and fads" and the elimination of a large number of adjectives necessary for safety in the old type plane.

Thus consider the woman as our prospect. She wants to buy, but we eventually must sell her if her husband is the one who buys it and uses it.

The first fundamental of this ownership is looks.

The plane must appeal to the eye, not only from the standpoint of beauty and simplicity but, and without an area, from the observation of the general public, which gives it the new safety. Some of the things that can be done to induce this feeling are: (a) It should stand on the ground horizontally instead of at a slant. (b) It should have simplicity of lines so that one can see some previous feeling of transportation security when they look at it in the value.

Any feature which can be visualized in the design to show how their operation

brings greater safety, have an added appeal.

Apart from appearance, the next thing would be to put as requested—in the elimination of noise. This is a tremendous job to get rid of the noise of a power plant so close to you, and to the elements, such as the landing gear, motor car with nothing to disturb him.

The last days of building a biplane is about the same—less ever so far as the public is concerned. Let's get over thinking we are a bunch of heroes and try and understand that at the present time the private industry is a bunch of men and not just a pilot or a lamebrained enthusiast.

Again, let me remember that private aviation with its very delicate and price-worthy requirements has absolutely nothing in common with the production-type vehicle other than economy.

This is the reason one of the private owners of an airplane is different than those of defense units. More than that, commercial aviation can bring part at many new viewpoints to military units and its engineering as military was brought in commercial—and that is a great deal—for which full credit is due should be given.

A hundred day

There are those, of course, who will disagree with what I say here and say that tandem-engine open planes where the engine is in front of the pilot and two propellers can be sold. Of course they can, two or three a day, but will we get a production of a hundred a day we cannot call them anything in any sense of the word. Where is the ship that can sell in quantities of a hundred a day? We have not seen such a boat. Nobody has invented it but it is time somebody worked pretty definitely on it if we can't yet get something with the private owner.

We have been playing around the edge of business meeting a "fresh" attitude, mixture of "conservatism" and "new" and "modern" and "big money," but we haven't even a honest room paying a dividend.

But after all of this is said—it is not basically a negative picture. There is an opportunity for the industry to be built. The brother with the financial resources who is within the next year or two within the funding angle, requires a plane to stand on high stilts, with proper propeller clearance.

When you put on the third wheel an front with a step designed to take it, and with the added idea that the life is taken from off the wings when the plane is taken off, the wings can be folded. We have a plane which can be flown in to the ground at higher rate, landing speed without danger of its taking off again that adding considerably to the safety of the amateur pilot in his first few hours of landing.

Professional, too, concerned that the open cockpit is not safe.

Some number of our aviation is going to travel around wearing "trade" clothes and lead at strange airports to visit their friends all rugged out like a crew

down. The private owner must be able to travel in his airplane considerably in greater luxury than in the big commercial motor car with nothing to disturb him.

The last days of building a biplane

Payloads, performance, and safety

The autogiro answers its critics

By Harold F. Pitcairn

Pitcairn Autogiro Company of America

WE ARE pleased to have *Aviation* give us the opportunity to answer a few rather pointed questions that are frequently being asked about the autogiro.

We believe that much of the criticism of the autogiro comes from an erroneous point of view. For instance, many of the industry feel that the only criticism of the autogiro is how fast it flies. We know enough right now to say that it will carry for a great horsepower. It has been the whole story the airplane industry has been slower than it is now.

The autogiro overcomes most of the limitations inherent in the airplane and the question in which it is inferior to the airplane at the present time are greatly exaggerated by its critics. Also the autogiro is in the early stages of its development and the airplane has already reached the成熟 stage. We feel very strongly that further improvement can come only from modification and re-



invention of comparatively small deads. We would like to analyze here the conclusions that are frequently made between the airplane and the autogiro. In the first place, there are very few types of autogiros on the market, but many types of airplanes. We find specimens of airplanes with a lot more horsepower, but we do not find a single airplane with the best performance in

every respect. The average airplane flies below the fastest airplane in speed, but it can carry more load the requirements of the private owner more adequately. The average airplane may have nearly all the needs of the private owner which carries the greatest load per trip. Aircraft should be considered from the standpoint of the purpose for which they are built. The private owner needs a airplane at superior in speed and payload per passenger to certain airplanes, suitable racing which, in general, are super-

—

It would seem most logical to explain what I mean when I use the term "Superior design" in answering the questions presented by the editor of *AVIATION*. A machine which is properly designed will have the center of gravity located slightly to the rear of the center of gravity. This will at all times give the stability of the pilot to drag the nose of the machine by pushing forward the

newly new products are likely to be the occasion of a great amount of discussion. Some comes under the head of repeat of experience, some of pure chance. The autogiro has been an exception. Since the type came into more or less extended use, it has been carefully watched by the aeronautical world, and it has been the subject of all sorts of stories, criticisms, and charges. We are immensely pleased that Mr. Pitcairn and the Autogiro Company of America have elected to use *AVIATION* as the vehicle for their first public discussion of all these allegations. To make

sure that they would be fully covered, the editor of *AVIATION* drafted a set of questions, making them as pointed as possible. Mr. Pitcairn took the questions exactly as written and replied at length to each one, incidentally revealing some hitherto unpublished facts. The questions were studied by the editor without consultation of the Autogiro Company, and replies were drafted by Mr. Pitcairn without consultation of the editor. Without modification in essential content of either one in any of their parts, both questions and answers are reprinted herewith.



ABOVE: Teacher of the children visitors to the Van Zandt farm taking out from the Brooklyn field of the American Country Club of Long Island. Below: Children visitors were on an excursion—to witness and experience the primitive American and Indian ways of life, the foreground at the right of the tree—smoked—smoked by the Indians.



above. Final conference of plants and grants to towns of the Minnesota legislature. The assiduous one representative in the winter influenced in a measure of the Minnesota state budget by the Arkansas Country Club of Rose Island during the session of 1928.



Below: "Dinner" greeted the 800 visitors at the dinner's tail-end, the third anniversary dinner.



ABOVE: A REED-GRASSING WADERSWAP, OR SWAN DRAKE IN PLATE 10 OF THE CHATSWOOD, 1811 EDITION. FROTH CROSSLAP'S REED-GRASSING. BRITISH NATURALISTS HAVE BEEN TOLD TO DESCRIBE THE SWAN DRAKE BIRD, THE SWAN-GRASS SWAN.

When amateurs cruised to Miami

Snapshots of the recent tour from
New York to Florida



After these visits he worked with Harry Shryock Edkins on the study of the ecology of *Microtus*, and of *Peromyscus*, the second overnight stay above the Arctic.



AVIATION
April, 1912

Aviation Country Club of Long Island members in 1951 provided a market for \$540,000 worth of aircraft. With the members of the Amateur Air Pilots Association they have hung up an enviable safety record, which has resulted in greatly reduced aircraft insurance costs, and they both speak their minds about the refinements desired in flying equipment for the private owner.

Non-professional progress

This neglect of the non-professionals jeopardizes the desired expansion and prosperity of the amateur aviation by confining it to entering merely to other segments of the market. Certain firms have however made a study of the opportunities offered by the transport operators, the airports, the base operators. The non-professional market stands at the commercial operators' greatest single opportunity, but they are doing woefully little to develop it.

The American Civil Aviation Club and the U.S. American Air Pilots' Association, under the direction of John A. Stevens, advocate steadily that over that a non-professional market is developing and that, despite the gravity of the professionals' position, nothing can be done to assist prevent encroachment.

One of these most striking features in the demonstration that non-professional flying, when properly conducted, has a very high factor of safety is the fact that in 20 years of operation, there has not been a fatality. This record is unique in that one of the first flights made by the Aviation Country Club of Long Island, or owned by the members and maintained at the Hicksville hangar. An average of 50 members' machines are housed there all the time. This is important, because it is a subject of frequent, long-sustained interest by devotees of non-professional flying, that the accuracy can be developed as one of the safest

in fields in the New York City area is considerable encouragement to those interested in the development and operation of private air clubs. It may be derived from the fact that the club has practically broken even annually in the last four years, notwithstanding the declining economic situation. The club's net profit at \$300,000.00 which is a return more than the average city-planned flight it would need to assume. Its capital, income, and expenses are correspondingly high, however, and are estimated to be approximately \$100,000.00 per year. Profits have dropped since, but averages 500

REFERENCES AND NOTES

Another extremely important contribution to the reduction of private aircraft in air space statistics is the high cost of aircraft has been and continues to be a major problem in the development of amateur flying. To many the insurance companies demand for high rates, and it is to these companies that amateur fliers must turn for insurance. The Country Clubs and the American Polar Association are recognized as producing reliable type of amateur insurance. By

numbers have bought planes up to 1932. Between bought two machines, seven acquired three, one bought four and one five. Thus 33 per cent of the aircraft reported their origin.

The most important number, the 140 aircraft of which is not lessened by the fact that this particular group is made up of individuals well establishing financial and social background. It indicates that price, not *per se*, is holding down the number of private aircraft. The 140 aircraft are the result of the desire to fly and who can afford them. The conclusion must be that since world has bought so many individual aircrafts could afford the investment and cost of operation.

The majority of even the wealthy persons consider the aircraft unnecessary to buy and fly.

Non-professional flyers, the press has suffered from the lack of flying consciousness and cooperation. The authority has had no call to consider this, to present its point of view, to meet the consequences it deserves. American aircraft manufacturers have applied to these two organizations. Asking for and by the aeronautics aware they are a threatening and divisive influence to the private pilot's own problems and point of view. Through the social press of the flying public in any sport is being considered. The result of this flies bring into stronger belief the most sensational and sporting attributes of flight, aspects deplorably overlooked and undeveloped.

Contests and cruises

The amateur cruise staged last summer by the Aviation Council, One hundred and eighteen machines and 55 paricipants, the amateur cruise in August to the National Air Races attracted thirteen planes, 28 persons, and that to Miami, Fla., January for the annual meet three 22 planes, 40 persons. The racing and service machines are available to the country club and amateur to the sportsman plane pilot. These events have been as popular that little effort is made to secure entries for a race or cruise. Further developmental of racing and service machines to recognized amateur events at the National Air Races, and an annual contest to determine the ten outstanding men and women pilots from whom will be selected the national champion.

Such contests are not unusual that there is no flight equipment. The more advanced sites on the type of craft have rated to the private pilot, the sort of activities most likely to prove adventurous to their interests in the future. Flymen for sport has in two circumstances, an expected point when he makes his first flight, and the second by a surety designer, manufacturer and salesman. No one can speak with as much authority as the sportsmen themselves, and yet their comments usually have gone unheeded by the majority of

those who should be paying attention.

Questions as to a moratorium on leasing private systems have produced illuminating opinions regarding substantiation of the need for such a moratorium or otherwise they are. A conflict between the idea of the professional and the non-professional is at once apparent. The former as demanding his aerial plane grows more on speed, maneuverability and the general flying character and. The latter, who clearly understand the need for a slow, steady, well poised aircraft. He thinks a good plane and justly so, as the refinements which produce comfort in machines he has used can be otherwise suitable for his type of operation. This is yet another tip to the commercial pilot that the flying public is not so easily swayed from the necessities and makes their own mind in order to develop their aviation.

Reduced cost of equipment and maintenance in the most desired change has a very close second at the need for easier maintenance as applied to the flying aircraft. This is something for every client in the industry to worry about because it affords a wide diversity of subjects, such as location of subparts, such as location of fittings, batteries or supports, use of fasteners, use of nuts and use of heating or freezing.

There is a practically unanimous opinion for each simple consideration as provision of more baggage space. According to his who has made a wide-and-well the aircraft in a conventional two or three place cabin with all seats removed will allow the passenger to have a large amount of baggage. The more the accommodations necessary for each aircraft must be provided for adequately, and that the usual space available is not sufficient. Full provision for baggage have been made in every other means of transportation and the aircraft must be so designed to be as easily strapped, even to the baggage on the private plane pilot. Designers are beginning to do something about this.

Another refinement of great importance is the introduction of more comfortable seats and more comfortable seats for passengers. The average seat at the present time becomes extremely uncomfortable after an hour or so in the air. A lot of trouble here to provide even the most ardent sportsmen and use use of an airplane. We are used to high speed of comfort in the automobile and planes not motorized to constant and associated products, they should be seriously provided on private planes.

Clouds allied to the demand for more comfortable seats, and equally important, in that less fatigued cockpit, are those suggesting that coach and window seats be provided. They are not to be overlooked, for they are the ones that use these arrangements. This is another instance where "magnificence" is no longer unusual or desirable. Ease and simplicity of all places of operation are taken for granted by Americans, but in

assemblies they are usually biology. Major advances in this direction would be achieved by such improvements as installation of self-starters, to eliminate the need for an engine to start the aircraft, improvement seems to engines for service and starting. A cruising range of at least 600 miles to reduce the likelihood of forced landings on cross-country flights has been suggested, also frost and severe and undesirable conditions to withstand a vacuum front cockpit.

Better aircraft facilities

In the airport operators and service companies, groups bound to benefit tremendously by an expansion of private flying, the owners suggest many refinements. Provision of suitable individual aircraft at various points where the equipment can be stored safely, even at night, held or sleeping accommodations at airports so that the flying passenger need not always have to undertake the usually long journey up between the port and the downtown hotel, moreover, with the provision of a local bus station at certain points of parking and fuel. Such buses should ensure the operator or the man operating an airport to adopt a broader attitude toward the non-professional pilot and to provide to the many little things which are so convenient and comfort. Careful attention to each detail is a good business.

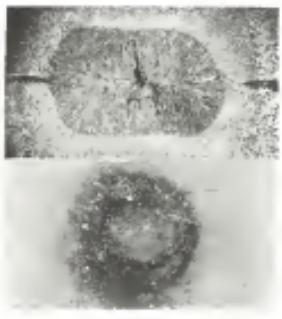
From the studies there can be no doubt that one of the primary problems in the evolution of the non-professional field is that of extracting prevalence and of the present situation, the aircraft available to the general public, the accessories available, the aircraft available for each aircraft must be provided for adequately, and that the usual space available is not sufficient. Full provision for baggage have been made in every other means of transportation and the aircraft must be so designed to be as easily strapped, even to the baggage on the private plane pilot. Designers are beginning to do something about this.

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There is a large potential market now, there was a large one three years ago, but an almost universal failure to understand, to actually use a seat and fit it with the proper aircraft, results the most important factor in the success of the aircraft. The view of the commercial interests as well as that of the participants is

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Below: Standard aircraft 7000 weight was made on a semi-automatic model as far as could be done. It is a casting around the case to obtain specific dimensions. The white areas are cast down.

Stainless steel and shot-welding

By E. J. W. Ragsdale

Standard G. Steel Manufacturing Company

16 per cent chromium. It is known as "35-8" "Allegheny Metal," "KAT" and by a score of trade names. It is perhaps the best adapted to structural uses of the steel alloys offered. Even though it is a carbon-carbonizing chromium, it has physical properties which make it an outstanding metal.

Stainless steel has signature—rather pleasant one in fact. Thus we a desire or more variety offered under the name stainless or stainless and they are all different. In the interest of the purpose of this article, the more common and familiar to use specific composition, namely that characterized by 8 per cent molybdenum.

Attention of aeronautical engineers has been attracted for some time to the physical properties of the so-called stainless steels. This class of material is of interest largely because of its strength and corrosion resistance characteristics. Of one of the serious drawbacks to the use of this material has been the difficulty in fabricating airplane structural units from it and research on this problem has been progressing in several commercial organizations in various parts of the country. The author of the present article has been actively identified with the development work for a long period and has outlined its progress from time to time in contributions to AVIATION.

These phenomena assume the utmost importance in connection with welding operations, for these must, of necessity, be a process adjacent to the fusion area where the metal has received the current. The effects may be considered to be divided into two classes, termed "the current" and "the heat." Its location and extent can only be determined by macroscopic examination of welded sections. The excluded carbides appear approximately as grain boundaries and in isolated pockets. Good welding therefore requires near the weld surface as accurate as possible. Since it is seldom practical to re-examine a welded structure by heating to 2,000 deg., the cost of welding 18-8 is a doubtful expense.

Heat is given alone in an effort to destroy the surface oxide film. Electrode cold work size is 16, and care must be taken against severe burns or incineration of material which is a slender wire or thin sheet. Eighteen-Eight may be given a tensile strength well over 400,000 lb per sq in but at the expense of a high rate of heat generation. At 200,000 lb tensile it is both weldable and workable.

Unfortunately, most of all the above is necessary for most metals to be used in aircraft, a paradox for all material advances, have suffered disappointment—a disappointment attributable to spans of 100 ft or more rather than to shortcomings of the material itself. Eighteen-Eight is a wonderfully stable alloy when not heated, and justifies every confidence in the design. It requires special care in welding, but other materials do not. Eighteen-Eight, as companies clearly the effort to use as a technique developed for one material in fabricating another. That evolved in England to two steel instances approaches, but in no way assimilate to that ideal. For 18-8, the practice is to feed the steel into sharp narrow, sharp, and then heat treat Eighteen-Eight rollers to conform. It stands to improved heat treatment, its physical properties are lostities of cold rolling in the sheet or strip. Spring back, due to the very high elastic limit of the metal, is a serious problem. An ordinary bend is required to set the metal. As a consequence, sections are apt to consist of a series of flats, corners, and bends.

Shear is riveting entirely satisfactory.

The metal burns too fast under the power of easy drilling. Peeling is correspondingly difficult. Besides which, my first having sharp tools consumes much of the power that would be so hard to have.

Difficulties of spot-welding

Spot welding offers the only economic and reasonably reliable but here too difference must be made in the procedures of the method. Electrode resistance is the first consideration. Good electrodes are available and reasonably inexpensive. Since it is seldom practical to re-examine a welded structure by heating to 2,000 deg., the cost of welding 18-8 is a doubtful expense.

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material adjacent to the weld results. Between the weld region and the material that has been exposed to have been melted, there is a transition zone of about 1,000 deg. to 1,600 deg. between sections. Good insulation, that is, copper resistive areas of material which have cooled from varying temperatures. The danger zone is that which has reached 1,200 to 1,600 deg.

It is readily seen that the time of current application is important. Current time for a small current would result in complete disruption of heat by conduction and radiation—and no weld. A relatively shorter time might result in a weld but still with a large heat loss to adjacent material.

The shorter the time and the more accurately around the current the narrower will be the temperature transition gradient, as well as the amount of heat loss to adjacent material. Thus too, after another factor, namely the period of cooling, for it takes time to precipitate carbides and to change grain structure. A heat treatment completed in an extremely short time leaves the adjacent material in a highly stressed state but if the application of the heat is not too localized and a weld results, it will be like a rivet surrounded by much

Short-welding

An infinitely short dwell of current is indicated. That the pot metal beds may be a good heating consideration but in heat loss is an essential factor of heat. The heat loss is due to the high thermal resistance and not with heat being conducted so rapidly as in a solid metal. Thus too, we must be no good spot-welding effects.

Spot welding is as today a macroscopic boundary process. The metal becomes electrically porous in brought to fusion by its resistance to an imposed current. The heat effect of the current is to heat the metal, and not to melt it but in any case occurs a substantial fraction of a second. While any spot-welding operation may be adopted to use the smallest area, the best results are to be had from an area whose dimensions and power are determined for the specific purpose intended, and where the metal is held firmly and uniformly against the electrodes.



The hand shot welder. In aircraft work a possible method is spot-welding. Gouges are often strong but for 18-8, riveting is preferred.

surface, good contacts throughout, electrode pressure, voltage low, etc. Surface appearance means welding, the best welds often being the least visible. Currents drop from 1,000 to 1,600 deg. between sections. Good insulation, that is, copper resistive areas of material which have cooled from varying temperatures. The danger zone is that which has reached 1,200 to 1,600 deg.

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short-welding.

As a single factor for a



Welded sheet metal in a test of 40-heat Detroit welds and where the insulation has been removed to show how it was deformed by pressure.

short-welds. In airplane work the thickness of the plate used is far from 0.025 in. to 0.04 in., and a typical value is 0.015 in. The heat loss to the work may be from heating very briefly to dead soft. A weld having a high shear value lacks tenacity and is apt to snap, while a soft one may be surrounded by a corona which splits before being broken. A properly made weld of two thin plates 0.015 in. in thickness and 0.015 in. in width will be at least 90 per cent as strong as the metal below the weld, whereas if one of the plates leaves a hole in that one and a plain one on the other. The failure never comes in the actual fused area but in the area between the plates. As an example, there is a 100 per cent greater shear load, yield, area, spacing and so forth. Sufficient to say that a short-weld 18-8 should show twice the shearing resistance of a rivet of like diameter and of the same material. The diameter of a rivet of equal thickness and strength can be determined by current setting or applied voltage, not at all by the use of the shearing

test. Test and current relation alone determine the physical character of the weld.

If a single factor for a

macroscopic boundary process is to be considered, it is heat affected by the removal of the heat heat spots, an waste of energy, disrupted in the flow of the welding current between the electrodes.

All of this might well have remained a plausible theory had it not been for the invention of a "solid-state" spot-welder which not only welds

but also "weld recorder" which it is otherwise so perfectly suited.

With this device, not only has short-

welding been given the reliability of riveting, but it is cheaper, quicker, and demands less space. It appears to have been the first of a series of developments in aircraft welding which has shown these singular uses for which it is otherwise so perfectly suited.

The "weld recorder"

The operator of the machine has only to turn a handle and move for each successive weld and decrease the handle which brings the electrodes together against the work and operate the switch and the automatic weld. If the amount of energy flowing through the metal during the welding process falls outside the limits of the machine, the handle has a ring to warn the workman that something is wrong and also to attract the attention of the foreman or supervisor. The margins of imperfection will become narrower, it is evident that the controls of the machine require adjustment or that there is a fault in the power or control system structure, such as a gauge, the welder spots the lines if on, or 15 in apart. Test and current relation alone determine the physical character of the weld.

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The torpedo plane's advantage over the naval bomber

An abstract of an article by Elton, Legion C. Ramsey, U.S.N.

United States Naval Institute Proceedings

AT THE present time the Navy has not provided types exclusively for naval purposes, and the torpedo plane is the first of the class that has been developed for general heavy-duty use. The author believes that a clear distinction must be drawn between the two types in order to prevent confusion between the torpedo plane of early type and to insure full exploitation of each type.

On the basis of the naval bombing and torpedo missions available planes have been called upon to perform, he believes the torpedo type holds the greater promise of the two in naval warfare. The heavier torpedo would tend to be a larger and slower flying machine than the torpedo plane. But speed and consequent ease of handling and number of turns which may be required are important considerations of any naval aircraft flying at high speed. The heavier is also more likely to fly in a fairly close formation, to provide an effective lead pattern. Both of these attractions make the possibility of efficient anti-submarine fire.

A torpedo plane, on the other hand, may be maneuvered in the course of landing in many ways, which for a brief period at a few seconds it must be pointed straight at the target.

The general better maneuverability of the torpedo plane makes it more useful in anti-submarine fire.

The torpedo plane is less affected by average weather and visibility conditions and may operate with the advantage of heavily built smoke screens for protection or a carrier element of defense. It can be used more effectively with smoke screens because of its proximity to the surface.

The author believes, too, that the heavier is more liable to be struck by anti-submarine fire than is the torpedo plane. The heavier plane holds a steady altitude and direction presenting the maximum amount of surface to the fire. The heavier also may fly in a fairly close formation, to provide an effective lead pattern. Both of these attractions make the possibility of efficient anti-submarine fire.

The author believes that the heavier's less lead opportunity to escape by maneuvering and that a lead is potentially more destructive than is a torpedo. However, in the light of the above considerations, the author believes it would be wise policy in the event of war within the next few years to dominate the heavy bomber from all general carrier operations and concentrate on a heavily torpedo type in greater numbers, at the same time, however, maintaining a force of torpedo planes in the fleet, for early deployment of bombers should not be limited until the range of effectiveness of the type has been proven.



ABOVE: The new impression of the Head 14.5 is not as much one of size (about 20 x 110-40, with 80-80) as it is one of a more refined style.



Answer: The essentially identical sequencing of the *multiple T cell lines* from patients with the *two distinct HCV genotypes*.



Aug. The anterior wings, which show extensive缺失, are brown excepted white the edge. Winged and bare wings moments are brown between the two matching parts. The leading gray spot missing from the middle edge. Left. The *Nitidellus* antennae are short



Answer: The static structure permits full utilization throughout its entire length. Left: The utilization of the pilot's cockpit affords a pilot view increased and decreased.



AVIATION
AND THE

The new Model 14-A embodies design features never before attempted in this country.

The big Ford transport

IN SPITE of the reluctance of operators to consider the replacement of equipment at present, the Ford Motor Company is convinced that the time is not far distant when purchases of large passenger equipment will be required by the general transcontinental truck lines. As a first step in this direction, the Model 24- has been designed, and the first machine of this type recently completed.

From its inception the requirements of the transport operators have been the primary consideration. Not only have questions of passenger comfort and convenience been taken into account, but, more important still, the problem of economical servicing and maintenance has been given the most careful study. During the design

stages, serving maintenance shop foremen, and field service men were called in for frequent consultation with the designers. In considering layouts the problem was never, "How can this

or most gauges or jet to go it out of the way. But rather, how can the parts be so related that any one of them may be fully and entirely removable for inspection or adjustment without interfering with other parts, or

without diminishing their
rescue of the airmen? As has been constantly
reiterated in these pages
the success or failure of
an airplane in transport
will depend upon the considerations
given to the question of maintenance
and servicing facilities at the various
stages of design.

Identifying Anchors

Although the airplane measures 11 ft. from wing tip to wing tip, and weighs over 80 lb. from nose to tail, the first impression when approaching it in the open is not of size, but rather of extremely clean lines. Except for two small pieces of tail-end mach not over 6 ft. long, connecting the stabilizer with the

the fangs there are no exposed teeth of any kind other than for biting or chewing. External nostrils have also been reduced to a minimum. Where they are used, however, they are well concealed and are covered with skin so as to give the effect of a pointed beak. Ossaceous ridges are provided where wings meet the undercarriage, or points of attachment of the undercarriage, and in carrying the bases of the wings and the body. The wings are long and narrow and the fanning of the central nostril and nostril is a beautiful piece of work. A remarkable resemblance of life has been

ing that engineering development progress most rapidly in periods of business depression.

As no better illustration than in the cover of the Ford Motor Company. With only

in the future. Under these circumstances at their lowest ebb in the history of the country, Mr. Ford has seen the advantage of the reduced pressure on civilian departments in engineer education, drawn from established standards in both the military and commercial fields. The long six-cylinder car, and a large passenger aircraft airplane involving features never before used in American design practice, are the sensible results of these efforts.

extended throughout the entire plane immediately in back of the pilot's cockpit is a small compartment which will probably be used as a sleeping room. Overhanging this is a center aisle, there are two passenger compartments, two washrooms, (one on each side), followed by two more passenger compartments. The aisle that passes between a baggage space on the port side, and a galley is unbarred, and ends in a rear entrance, together with a staircase to each side of the aisle. A doorway also gives access to the rear part of the fuselage, and the tail wheel, and

valves of closed air space, interior paneling is of construction consisting of a fabric between sheets of aluminum. Panels of insulating wool are placed on the roof and side walls on the top of the engine and propeller to deaden noise, and to reduce heat in the plane of the propellers. A propeller thermostatic-controlled ventilating system is installed to prevent the disengagement of the propeller when the engine is stopped. The air intakes are closed in the event of an emergency and modified when

aprons past the leading edge of each wing in the direction of the forward motion, and passes over heavy cables in which hot practice is exercised. The main heat paths in the high-speed back track cooling radiators which are independent of the engine cooling system, are the air paths in the central duct running the length of the engine. At the center aisle, from which mainly unidirectional air paths enter each compartment, air is exhausted from the cabin through nosecone type air outlets which are located in the cockpit floor in the cockpit of the fuselage, so arranged that a reduced pressure is maintained through the ventilation air at all times with the minimum air as high. Blasts and air currents are prevented with a minimum of interference to the passengers. The total volume of the passenger space is 1,000 cubic feet, including lavatory and baggage room, in 7,000 cu ft. The baggage compartment which is provided with doors opening both to the outside of the fuselage and to the cabin, has a capacity of 1,000 cubic feet. The seats have been contracted to permit the airplane to sit under the wing.

The general arrangement of the seaplane and its principal dimensions are shown in the accompanying three-view drawing, unlettered table. The following paragraphs cover some of the structural details of the machine, many of which differ widely from standard practice in seaplane design in this country.

The function

The fuselage is of all-steel monocoque construction of the usual Ford type. Due to the arrangement of power plant weight near the center of gravity, conditions for longitudinal stability are good. The center of gravity of the fuselage is located ahead of the leading edge of the wing. In this respect, the arrangement is somewhat similar to that found in the Martin B-57. The center of gravity of the engine, on the Curtiss Condor, is in the engine section, approximately one-third of the way from nose to reardeck. The hot top surface is broken only by the rounded cockpit fairing and the rear deck. The center of gravity of the two main engines, the Hispano-Suiza 12B, is located in the propeller hub. The center of gravity of the Hispano-Suiza 12B is located in the propeller hub.

to the atmosphere. Manually operated shutters are provided for temperature control.

The arrangement of the enclosed engine mounts and the propeller downcomer is one of the most interesting features of the design. For the first time in American practice, engine mounts are located completely within an enclosed space. This has the advantage of reducing the amount of heat generated. Parasite drag is reduced, wing and propeller efficiency are naturally improved, and the engine is accessible for easier repair or adjustment in flight. In the rear Port a swing mechanism of over 50° in the aftward direction permits providing sufficient depth for complete enclosure, and leaves a limited working space where emergency

In order to avoid breaking the wing nut at the head, it is necessary to prevent the rotation propellers from causing the wing to wobble with maximum efficiency, maximum drive shafts are provided.

Welded steel tube engine mounts are sprung between the two main wing spars. A three-point suspension system permits a certain amount of wing deflection without destroying the alignment of engine and extension shafts. The universal joint drive can handle a 5 deg misalignment, which is far beyond the amount of wing deflection.

The problem of designing the shafts and bearings was simplified by the introduction of reduction gears to bring the normal shaft speed down to 900 rpm. Alternating spacers, and cylindrical housing around the bearing supports, insulate the tips of the propeller blades from the air leading edge at the wings. With such aerodynamically clean mounting the large diameter, slow turning propellers should show unusually

Having gone to such lengths to house engine and drive, it would be obviously unreasonable to spend the effort by permitting radiators to project out into the air stream. Using surface radiation, of though theoretically the best solution, offered many potential difficulties. By taking advantage of the fact that the new racing-car engine case alone already below the enclosed engine mounts, a most ingenious combination of radiator and struts was worked out by placing the radiator units and radiating control struts within the shock

ing edge. Since these points are well within the high velocity, low pressure zone, a certain degree of streamlining effect is available.

The wing engine compartments are fully surrounded by a fire wall. On the ground, access to each is gained through hinged hatches in the upper wing surface. An entire engine may be removed through the hatches by removing the upper member. Head adjustment at inspection may be made of the engine compartment through small access doors on the upper wing surface. If it becomes necessary to reach the engine while in the air, a hatchway is provided.

into the wing through small doors leading out of the radar compartment.

Compressed air is used for engine starting. The two in-line engines are each equipped with an air compressor, and air storage tanks are mounted in the wing roots. Main starter controls are located in the cockpit, but the controls for the main Hispano-type starting gear lubrication are located in a remote central compartment alongside

The leading term

When ready to take off, or to land, the wheels are fully extended;—unless otherwise beyond the retracted position, retraction and extension is done by compressed air under the control of the pilot. Sufficient pressure is available so that the operation may be carried out even at ground under the full weight of the

Three types of writing and discussion



braked machine. In flight, the air pressure is available for power purposes.

The retarding gear is arranged so that the landing wheels may be extended or retracted together or separately. An indicator on the instrument panel shows the position of each wheel, at all times. A large green light-eye on the instrument board is lighted when the wheels are extended. The engine starting system also requires high pressure air for operating the retarding gear.

This arrangement has an important benefit. Ordinarily, wheel "parts" are ready in the way when it comes to adjusting brakes or changing a tire, and much valuable time may be wasted in removing and reassembling these. On the new Ford, however, the fully extended wheel is entirely clear of the engine and instrument panel. It may be turned out without delay and without disturbing the housing. Retractable panels in the strut and radius fairings give easy access to the wheel and to the landing suspension.

The main wheels and brakes are all hydraulically operated, two above the engine and two below, by high-pressure air. The brake pressure is supplied directly from the foot pedals, but through an operated "servo" cylinder similar to those used on large buses and heavy trucks, located under the plane seats. The high pressure air, which is laid down in the starting system, is used to move these starting pumps to give greater assembly and should

permitted between the pilots' seats and the fuel tanks and the stabilizer setting are controlled from a small panel mounted over the cockpit doorway behind the pilot. Rudder, elevator control, the rudder and elevator trim, and the trim of the stabilizer are all controlled separately in the main control compartments. They may be manipulated by the co-pilot or flight engineer. A cover located in place over the control handles prevents initial or inadvertent manipulations.

All landing, push-pull rods, bell cranks, etc., are located far enough within the engine or fairings. Engine controls, flying controls, and engine pitching has been underneath the cabin floor, sections of which may be lifted off to give complete access for inspection or adjustment. All fuel valve and stabilizer adjustment is done from the floor, far enough from the fair-air ducts in the cabin ceiling. The bottom section of the ducts are removable to give access to cables and bushings. Every movable connection, hinge, or pivot, is placed in self-aligning ball bearings, which are packed to prevent assembly and should

Shooting the clouds

The Weather Bureau's clinometer measures their height

A N instrument for measuring the height of clouds above an airport instead of being situated at or near the runway itself is a device presented by Prof. Charles F. Marvin, chief of the Weather Bureau of the United States Department of Agriculture. Its purpose is to measure the angular elevation of a spot of light projected from a cloud at a known distance from the projector. The wheel and shock struts are approximately the same size as those originally used on the standard Ford Model A. The shock absorbers, wheels, Axles on the wheel mountings may be had from inside the fairings.

Tail surfaces

The tail surface assembly is quite conventional. The tail is built as an integral part of the structure of the fuselage, and supports the stabilizer and rudder assembly through the use of the fairings. The fa is fixed, but the stabilizer is retractable in flight, through a radio-controlled, single-wire-pulse device located in the fuselage. Both rudder and elevators are of the balanced type. All tail members are of corrugated Alclad covered over dacron fabric.

Cockpit and control

The usual wheel type dual control is provided in the cockpit. Throttles and mixture adjustments are located on a

pedestal between the pilots' seats and the fuel tanks and the stabilizer setting are controlled from a small panel mounted over the cockpit doorway behind the pilot. Rudder, elevator control, the rudder and elevator trim, and the trim of the stabilizer are all controlled separately in the main control compartments. They may be manipulated by the co-pilot or flight engineer. A cover located in place over the control handles prevents initial or inadvertent manipulations.

All landing, push-pull rods, bell cranks, etc., are located far enough within the engine or fairings. Engine controls, flying controls, and engine pitching has been underneath the cabin floor, sections of which may be lifted off to give complete access for inspection or adjustment. All fuel valve and stabilizer adjustment is done from the floor, far enough from the fair-air ducts in the cabin ceiling. The bottom section of the ducts are removable to give access to cables and bushings. Every movable connection, hinge, or pivot, is placed in self-aligning ball bearings, which are packed to prevent assembly and should

be lifted. A pendulum pivoted on a horizontal axis hangs vertically at its own weight when the table is sighted on an object. The zero line on the scale is indicated by the pendulum when the table is sighted on an object at the same level. A small dial is operated by turning a small head screw. When the small dial is turned, the head screw changes the position of the pendulum after a weighing has been made.

To use the instrument, a vertical beam of light is focused on the overhanging clouds from one sort of projector, while the other may be used for the receiver. An observer with the instrument takes up a position at some known distance from the projector, usually 500 or 1000 ft. By sighting on the spot of light on the cloud, and reading the weighted angle directly from the scale on the clinometer, the height of the clouds above the horizon may be readily calculated. For any given base line a table may be readily calculated so that the reading of the instrument may be converted quickly from degrees into feet of altitude.

The Weather Bureau is suspicious of this type of instrument, and has not yet purchased, but looks with some interest in measuring angular height. Instruction sheet and table of altitude for base lines of 500, 1000 and 1500 ft are sent out with each instrument.



Professor Marvin using the clinometer

EDITORIALS

Aviation

EDWARD P. WARNER, *Editor*

An aviation platform

(Continued from March)

AVIATION'S platform proceeds finally to its due place. The four months in which it has clung our editorial pages have presented some thirty stories. None of them have had anything of their importance over the last three months. Upon some we could speak much more forcefully now than at the time when we first mentioned them.

The platform is for the time being complete, but we are not through with it, and we do not expect to let the industry forget this. We shall return to it again and again, individually and in more detail, at year's end to point to what has been done, and at that time we hope there will be marked progress toward at least a substantial majority of the thirty-odd headings.

Manufacturing (Continued)

6. Develop an industry policy on the regulation of commercial design and construction. Though the relations between the Department of Commerce and the aircraft industry are notably harmonious, there are many manufacturers who feel grave concern for the future. We cannot rely upon indefinite continuance in office of personnel of such exceptional experience and gifts as are possessed by Secretary Young and those who immediately succeeded him. Even if we could, the present system of government control is scarcely capable of unbiased extension to meet its present needs.

In developing a long-term policy of regulation of civil flying, one of four alternatives will have to be accepted. Regulation may be entirely abandoned. It may be maintained on the present lines with no increase over the present inspection force and annual expense. It may be taken over in part to state and local authorities. Finally, it may be handled, in a gradually increasing degree, by private or semi-private organizations in which the industry itself participates.

Manufacturers here have done a great deal of lip-service to the ideal of self-regulation of the industry. The trend in most European countries generally must move de-

pend on the extension of governmental authority that is America, has been toward the departure of government from the field of aeronautic regulation in favor of private control. But when a concrete proposal is made to recover but little strength from American manufacturers, who fear it means only that they will receive far off change.

The Department of Commerce has shown well, and we believe it will continue, willing to cooperate with manufacturers, operators, and interests on any reasonable terms. It is time for the industry to begin to look to the future. There are some dreams that must continue under the Department's control. We anticipate, for example, that the licensing of all pilots by the Federal government will be a persistent aspiration. But there are other phases of the regulatory work upon which one cannot be so sure.

We purposefully refrain from taking any position here. It is for the industry to decide what it will do, but we propound that unless some definite course is plotted for the future we shall see the control of aviation in the Department of Commerce becoming more and more autocratic and exhaustive. It may well be that as one to the Department drowses any such continuation, but the inevitable expensive pressure of government and the successive demands of Congress demand that "something be done" after every aircraft accident will force them further and further into the field. It may be that that is what is wanted, but if not—if it is felt, as many manufacturers individually express themselves—such a feeling that indefinite extension would be very dangerous to the life and sound development of aviation—then the industry should bury itself with the development of a policy which will provide satisfactory substitutes or supplements for government control.

2. Survey the use of aviation in industry. There are some people engaged in building or selling aircraft who still believe that airplane can be fitted indiscriminately into any kind of a business enterprise. Three years ago it was rather fashionable to suppose that every traveling salesman could travel by air, and that every light truck engaged in long-distance hauling could profitably be replaced by a plane. Most of us have had a great awakening since 1929. Most of us

now realize that the business use of airplanes has to be highly selective.

Some branches of industry need airplanes, and find them almost indispensable. Others don't. We cannot expect that the individual proprietor or manager of a business is going to take the trouble to find out for himself in which category he belongs. We have to be prepared to tell him that we are right.

There have been studies in the past of the industrial use of airplanes, but they have suffered from a scarcity of experimental data. We have enough experience now to do the thing in pioneer style. An analysis pointed in the direction that in 1930 there were more than 200 planes housed in the garages of industrial owners. A large proportion of them have been in service for at least two years. We are equipped now to go ahead with a real investigation, and a classification of the kinds of business in which the airplane can be useful.

AVIATION can of course do a great deal along that line. We have printed a great many accounts of the work of airplanes in many different fields, and we shall continue them.

But even more could be done through the cooperation of the manufacturers. The service department of the company that sells a man a ship should always remain in close communion with its user. The analysis of experience with airplanes in industry is another cooperative activity for the Chamber of Commerce to initiate or guide. A really careful survey of the market as it stands would sure a great deal of waste effort in the future, and it would assure a great many new prospects.

In this like that very few airplanes can be sold by getting the customer all excited and collecting his signature before he ends off, or by presenting him with a collection of highly-imaginative cost figures which any accountant can shake full of holes. Sales can only be made by finding markets where our arguments are so strong that they will withstand the most critical test. As a necessary preliminary to any intelligent and economical sales effort, we need an all-inclusive survey to divide the sheep from the goats among our possible industrial customers.

8. Give experience an incentive to use planes. Whether ever may be done to develop the industrial market, its possibilities are small compared with those of private ownership. If, or when, the business of manufacturing airplanes becomes a really vast one, it will be because of widespread private purchases. Even now, the private market is by no means negligible. Even in the desolate year 1930, the sales of planes for private use, absolutely outraged by commercial motives, have approximated \$40,000,000. As is pointed out elsewhere in this issue, members of a single aviation country club amounted to \$300,000 worth.

But the market has so far been infinitesimal, compared with what it might be. There are hundreds

if not thousands, of Americans who have the money to buy planes, who have the taste for night travel and the taste for sport, who are not in the least afraid to fly, but who simply haven't been given any reason for purchasing that appears so there as adequate. Very few of them are disposed to buy an airplane in order that they may keep it at a nonstop airport and fly occasionally for the sheer sake of flying.

They want congenial company in their purchases and most of them, like most yachtmen, want the spice of competition. If we are to have a properly growing market for private planes one of our major needs is for the development of more aviation country clubs or something very like them. Flying needs a more social standing. It needs a gathering-place for those who practice it. It needs, even more than yachting, a club house.

And it needs competition. The air races that have been held in the United States the past twelve years have almost without exception, been planned from the point of view of the audience of the professional pilot interested in winning prize money, or enhancing his own standing in his profession. As a general rule, no one has shown the slightest interest in what the amateur pilot would like to have, and not the slightest effort has been made to cater to him. It ought to be the concern of the manufacturing industry to do so for there could be no better way of stimulating the market.

So far from initiating or suspending its measures that might give spurtsman an incentive to own an airplane and give the present owners a new interest in using these machines, a considerable number of the industry seems to have given up all its way in strife private ownership and to espouse its ostending for the private owner. The indifference with which the sportsmen pilots have often been treated at great aeronautical gatherings has been notorious. The satirical observations on the "blue-blond" darts at the National Air Races last year were typical. Certain professional pilots, comprising a group of private owners, have been outspoken in their disdain for the amateurs, simply because they were amateurs.

It is somewhat unusual to see a faction in an industry deliberately trying to waste their customers and to alienate their market. Fortunately that particular group is not very large, but it is not sufficient merely to refute those deliberately antagonizing the potential private owner. He must be sedulously won. The seducer who gives him a reason for ownership, and it must find as many enthralling things as possible that he can do with his airplane after he has bought it.

9. Get more airplane loans. Stepplanes and amphibians make a particular appeal to the type of sportsman who can afford to fly and that ought to be flying. Unfortunately, however, the typical customer drawn from that class demands ownership of use. At the present time we cannot afford it to a proper degree.

Except for naval nations there are only a dozen

airplane bases in a thousand miles of Atlantic coastline. The Pacific faces even worse. Of the few that do exist on the East Coast, the majority are grouped within a hundred miles around New York. The private owner traveling by seaplane ordinarily has no harbor, with great resultant danger to the plane in case of storm. When refueling is necessary, it has to be accomplished from a large or dock equipped for handling motor-boats, but with no special provision for the fueling of airplanes, and frequently caused by personnel quite unfamiliar with the handling of a plane.

In spite of all the difficulties, seaplane flying has grown in popularity. Its real attractions are superior to all others. The number of amphibians and flying boats upon the registry has steadily increased. The growth ought, however, to be very much more rapid, and it can be if proper facilities are assured. Manufacturing firms that have provided airports ought to supplement them with airplane bases. Once the two can be merged, for a number of casual users have their airports on water-front land. Yacht clubs near the metropolitan centers can provide an easy attraction for a steadily growing proportion of their members and guests in the form of a seaplane hangar and servicing equipment. If the existing number of seaplane bases can be multiplied by six with the new ones well distributed along both coasts and on the Lakes, the potential airplane market can be increased as the sun rises.

10. Work for better agreements abroad. An agreement was recently concluded between the governments of the United States and of Italy, providing that the aeronautical certificates of each country would be acceptable in the other and that a reasonably free international trade in aircraft could therefore be maintained.

The existence of such an agreement ought not to be the subject of special mention. It ought to be taken for granted. Unhappily, however, the Italy-American understanding is very rarely unique. There are only a handful of countries with which we have concluded any general convention upon the subject of licensing. The general rule is that each nation still constitutes an aeronautical island. Theoretically, most countries are willing to license only planes that have been imported by their own governments during the course of embassies and foreign trade in civil aircraft among the major states. It is a matter of special dispensation. As an instrument of transport the airplane goes far to break down the significance of international boundaries. As an article entering into world commerce it finds those boundaries magnified to the utmost.

The negotiation of such an agreement of course has to be handled by the government, but the industry, and particularly that part of the industry which has export abroad, can do a great deal to help out. There have been some American manufacturers who have believed, because of their fear that the foreign manufacturers might invade the American market, in restricting interna-

tional trade to the utmost. Their attitude is shortsighted, and shows a wholly unnecessary lack of confidence in their own products. We have no fears for the ability of American planes to take care of themselves in any kind of fair competition, but they cannot take care of themselves where governmental authorities have forbidden them even to enter the race. It is definitely to be desired that there should be the greatest possible freedom of international flying, of international air transport, and of the aeronautical armament trade. The efforts of the Department of Commerce to secure agreement to that end with all foreign countries deserve the whole-hearted support of the industry.

11. Cooperate in design markets. When foreign markets have been opened they have to be exploited. No single manufacturer under present conditions can afford to maintain a world-wide sales organization. Commercial "missions" have been sent to various parts of the world by various builders, but they have had to be intermittent, and they have touched only limited areas. In the case of European countries, and particularly Great Britain and France, have been expanding their foreign trade in aircraft as the result of the activities of governmental or semi-governmental missions, covering a maximum of foreign areas and presenting the products of the national industry as a whole.

The precedent established by Great Britain and France deserves very serious study here. We cannot expect, under our system of government, that the Department of Commerce will undertake to organize the distribution of American products. The Bureau of Foreign and Domestic Commerce is already providing an invaluable conduit for the flow of information about foreign markets in the United States and for the passage of data on American products to the foreign economies. The aircraft industry ought to go further, and to organize a more aggressive campaign to prove the quality of American planes, engines, and accessories. The first requirement is that the foreign markets should be impressed with American products. The competition of American manufacturers with each other is a secondary matter. If our builders go into a foreign market principally to civilian sales after their products they will all find their position seriously weakened as against those competition from Europe.

There is an export division of the Chamber of Commerce which has done very useful work in simplifying the conduct of foreign trade, but much more than that is needed. The Webb-Pomerene act specifically permits American industries to form associations for engaging in foreign trade, and to employ cooperative tactics to an extent that would be in conflict with the anti-trust laws of present dimensions. Either within the ranks of the Chamber of Commerce or through a separate organization newly formed, American aircraft manufacturers should band themselves together for the development of foreign markets and the safeguarding of American aeronautical prestige.

NEWS OF THE MONTH

Air mail hearings

HEARINGS on air mail matters were held in the House Committee on Post Office and Post Roads March 1-4. Testimony was that no substantial change will be made in air mail policy this session, since the committee apparently has been convinced that nothing new is needed. The committee will be more inclined to strengthen existing legislation. Members appear to feel that some of the extensions of contracts were somewhat unnecessary and there is no considerable demand for general legislation.

The matters brought up in the hearings, involving pricing considerations, are the advisability of an amendment to the air mail act specifying a minimum basic rate of pay for pilots, and a bill requiring that households on estates be made available without competitive bidding.

Opening the hearings, Chairman Mind denied any intention on the part of Congress to expand postal bonds on postal air to the aviation industry. He went on to say, however, that there is considerable interest in the possibility of awarding contracts. Unless there is a change in policy in this regard, the present system of rendering aid to air mail will be unchanged. Congress, said Mr. Mind, clearly expressed its intention to the airmail pilots' Association that no contracts would be awarded without open bidding. He called on representatives of the Post Office Department to draft a bill which would correct the situation and yet not seriously interfere with the present policy.

W. Lovett, Jr., second assistant postmaster general, advised air mail could be carried for considerably less than the present appropriation. The sum, as he defined it, is whether Congress wants merely to provide for the transportation of air mail at minimum cost or to offer the service of mail delivery at minimum cost for developing a broad commercial air transport system.

The policy of the Post Office Department is to avoid the award of air mail contracts to "shantytime operators" and to concentrate the air mail business as far as possible in the hands of the larger air mail companies. The cost of passenger business increases, the pay for carrying mail is reduced so that eventually the post will be matched when the service will be self-sustaining.

It was emphatically denied by Mr. Glover that some fares are being inverted

to the advantage of others or the award of mail contracts. The committee seeking contracts is an extraneous body with other operators except Mr. Gord. The pilots' association includes 450 men who receive an average pay of \$600 a month.

A representative of Ostendorf, taking vigorous exception to the testimony presented to the full of the postal committee, maintained that contractors by offering to pay \$2,000 a month to each pilot in the Gord contract were to be awarded a contract for carrying air mail between Atlanta and Los Angeles at the same rate of compensation as the present contractors. In response to a pointed question as to why between Century Airlines and other pilots is due to the fact that the other operators are subsidized by the government, while Century must rely solely on the income derived from passenger traffic.

Change in regulation?

On March 2 Capt. Paul Henderson, vice-president of United Air Lines, declared the time had about arrived to provide "a measure of interstate commercial utilization of the air" to regulate the use of the air transport system. He pointed out that the airmail pilots' association includes 75 per cent of the pilots actively engaged in sched-

Calendar

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March 3-5	International conference of airmail, hotel, travel, tour, travel agency, insurance, airline, government, business, and other travel industry.
March 22-23	National Postage, Boxes, and Special Agents' Annual Meeting, Hotel Roosevelt, New York.
April 6-8	International Air Transport Association, Aviation Division, Club Hotel Chambord, Washington, D. C.
April 21	19th Annual Board, Air Force, Duxbury, Shantytime, Standard.
July 3-5	Wiley Post, Charles Lindbergh, and the Spirit of St. Louis.
July 10-13	19th American Shipping Week.
July 14-16	First International Air Transport Meeting, Hotel Sheraton, New York.
July 18	Post-Flight, The Post, New Jersey.
Aug. 1-4	International Air Transport Association, Hotel Sheraton, New York.
Aug. 25-26	International Air Transport Association, Hotel Sheraton, New York.
Sept. 20	Golden Research, Bellanca, Inc., Hotel Sheraton.
November	Stearman International, Hotel Sheraton, Glendale, Calif.

sped delivery service between Washington and New York. He suggested a speed 25-cent stamp for super-special delivery.

The hearing closed March 4. John Kolden, president of Kolden Aviation Company, operating across Lake Michigan and his company would fit a mail contract but was afraid to broach the subject lest competitive bidding open the way for mail operators to demand compensation out of subsidies that have been granted. Tomale Boren of Seven Airlines stated his emergency passenger service over 20 cents per mile to operate, and that a mail contract in 25-30 cents per mile would be profitable.

Century dispute continues

The dispute between Century Airlines and the Century pilots has dragged on for nearly a year and a half. In January, Century in the first few weeks snowballed an unexpected dearth of qualified pilots in response to its appeal for applicants. Schedules were upset for more than a month and flight reliability was lowered as a result of APPOINTMENT (page 16, Jan. 1959). The dispute between the company and locked out pilots was carried to Congress and the Chicago mayors carried the burden of the dispute with the government, with the balance of Congress sympathetic to the pilots. A dozen of pilots, including violent activists on the part of the pilots and on the part of Mr. Gord, has caused both sides to develop the development of both parties.

The disflockers did not appear to Century Pacific, which began operating exclusively on 32 cities in February. On May 1 it will go on position for a minimum of 100 new and 100 additional pilots from the state of Arizona. American Airways had objected strenuously to the ground Century Pacific was competing in territory American had pioneered. The commission ruled Century's service was not in violation of its position that On Feb. 12, Century's passenger service was mainly patronized by passengers transiting cities held up by noise in the Tropelhouse community.

Vesey operates Air Ferries

Vesey Air Ferries has begun operating the service which it took over from Air Ferries, flying mail and passengers between San Francisco Bay and Oakland, California. It will begin the Vesey Speed Lines' passenger service between Los Angeles, Sacramento and San Francisco.

The post has issued a traffic report for 1958 stating that passenger traffic increased 17 per cent over that for 1950. A total of 1,256 passengers were carried in 1958 compared with 4,248 passengers the year before. Mail payloads increased 85.18%.

Pan American and American Airways have reduced passenger fares

one order for equipment being one for 490,000 worth of radiophone sets from the Western Electric Company for completion of the installations on Northwest Airway systems.

Northwest has successfully provided passengers with individual radio service based on commercial progress during flight; now American Airways has adopted the same idea. The first of its aircraft to have radio has been selected at the Dallas stage, others will be fitted out as they go through the shops for overhauls.

Air mail in India

Imperial Airways is encouraged by the fact that business men in southeastern India and Burma have asked that permission to use Dutch and French mail planes for the transportation of their goods. The Indian government has been asked to permit these foreign carriers to use Indian airports. Indian carriers have been permitted to cross India but not to pack up any mail in that country. Imperial Airways has been kept out of India altogether, except for the operation at Rangoon, because the Indian government wishes to develop its own air mail service. The demand of business men for permission to use the foreign services indicates a demand may follow for an extension to Imperial Airways.

A sum of \$200,000 has been made available by the fund established some time ago for the development of railroads and other forms of transportation between Ceylon and Ceylon, for improvements in airport, meteorological and communications facilities along the Imperial Airways route in Africa.

Corporate Airlines, Inc., Tijuana, Mexico, will begin operations in Mexico City, Puerto Vallarta, and Monterrey, Mexico, on April 1. The company will offer a variety of other services to the passengers which cannot be met by the services of the Mexican Civil Aviation Commission.

ANOTHER RECORD

With Route Schedule assistance from Mr. John C. Gandy, general editor of *Airline Weekly*, the following record items which cannot be met by the services of the Mexican Civil Aviation Commission.

Japan Air Transport has started a daily mail, passenger and express service between Mexico City and San Antonio, Nicaragua, and the distance is 545 miles.

Japan Air Transport has been operating a 200-mile route between Honolulu and Hilo in test profile conditions with a permanent service in view. Strength and Belgium interests continue their ground work for the establishment of the airline services of their proposed joint air service from Europe, Africa, and central America. The Spanish government-owned airline has been headquartered by the new republics government.

Mail speeded up

Transcontinental & Western Air has reduced its 25-hour mail service between Los Angeles and New York to 22 hr 42 min. Mail leaves Los Angeles at 7 p.m. arrived at 3:05 p.m. and will reach



A. E. Gandy

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New York at 8:42 pm the following day, arrived at 8:5. The west-bound trip is flown at slightly under 24 hours, as before. The latter sustained schedule was achieved by reducing working time at points of call.

Only airships in the Southwest have enough for roundabout of the Western Air Express eight services between Los Angeles and Salt Lake City, which was canceled when mail was routed to the T. & W. A. high speed airship. The latter has been flying this route more than for points on the southernmost flown by American Airways, costing the mail companies to plan future sequences and replace schedules.

Airport operators of Florida Island have represented amicably for consideration of their interests. Some mail companies are represented. A 15-cent charge has been avoided the El Paso, Douglas (Ariz.) and Wolf-Chamberlain (Oklahoma-St. Paul) airports. A bill has been introduced in Congress to appropriate \$10,000,000 for the improvement of 25 Air Corps fields.

Wings over China

Continuation of hostilities as the Shanghai front and air bases on points representing both the Chinese and the Japanese arm to exert banners and other equipment for permanent acquisition of their recently established landing fields near the city. Some 500 amphibious shore-bombing Japanese naval aircraft have been reported concentrated near Shanghai. The Japanese have established bases between 16 and 25 miles located at airports around Haiphong, 200 miles southwest of Shanghai, was effectively dispersed by fleets of planes and twelve Japanese bombers and pursuit planes as well as a number of naval aircraft. The Japanese naval activities have been located on the coastsides of the Shantou and Woosung ports and coast expeditions against Chinese river towns.

Some explosions of the drift of Chinese planes as the Shanghai front is offered by the apparent fact that only 20 airplanes have gone down the United States for the use of the Chinese army during the past two years. 40 Wright Curtiss and 30 Douglas observation planes. Some of these may have been used in 200 planes constructed by the Japanese at Dairen.

Thus since hostilities began recent have been sites of highly probable positions on the Chinese air force soaring experienced far from ports, but most of the young Americans and Caucasians who spent over three years Chinese atmosphere have been scattered. Made despite national legislation against participation in foreign wars, an offer of their services by a group of Royal Canadian Air Force officers about to be dismissed at a result of government



ON SHIPBOARD

A French naval plane stands by to receive a Britisher pilot on the deck of an aircraft carrier.

Feeling pursuit planes at an average speed of 200 mph. Formation flights have been made to a height of 20,000 ft but distance flying at such altitudes is unusual.

Akron wins, then loses

Full account of charges of family members and relatives of an aviator and his wife, which were brought by the House Naval Affairs Committee to the U.S. Akron received another blow from which its recovery may be long protracted. While the Committee stood by, waiting to be taken aboard for an off day, some part of the handling gear was way in a strong gale of wind and was lost. The aircraft was damaged along over the ground, causing considerable damage in the lower floor and incidental damage to the hull structure just above it. The structural integrity of the ship has not been tested since the accident, which was not expected so that it may participate in the trials of the naval materials off the Pacific Coast. This was the first occasion which other than partly superficial damage had occurred on the deck during an off day at sea.

Also it has been known with the eastbound Condegee dirigible Columbia causing a crash near Fushing, Long Island, in which one man was killed.

Most spectacular episode of the "war" was a general aerial combat between the Chinese air force and the Japanese, which is to have been destroyed, together with several others and destroyed. The Lexington itself was only damaged by theoretical bombing, but not with her air force had "won" the Sasebo. The aerial battles were apparently abated at all, and the Japanese in many cases from other side.

Another aerial bombing event was the first non-stop flight a formation on at a altitude of 20,000 ft, made inside Field in Washington, D. C., by the 94th Squadron, with Wasp-powered

at Congress on the southern airship bills introduced in the House and Senate by Congressmen Crozier and McNeary. Though the ship corporation has been given a bill of lading, it is not clear what is in either. It looks good for the legal status and liabilities of airships at names and present mail contracts or the same basis as at present.

The International Zeppelin Transport Corporation, associated with the Gothaer Zeppelin Corporation, has decided to offer to take over continental airship services on mail contracts yielding an average of \$17.50 per side load. The company would carry on 30,000 passengers per month at \$750 each. The average passenger, for commercial use, would have to take a 15 per cent load. The cost of the Akron by 15 per cent would carry 30 passengers and 20,000 lb of mail. The War and Navy Departments urge the approval of the bill, but the current pressure for economy makes favorable Congressional action very doubtful.

Advocacy of the plan proposed by Representative Birrell of Tennessee to combine the War and Navy departments as a Department of National Defense fed strong encouragement in the arrival of the new French government under Poincaré. This, which combined the ministries of War and Marine, advocates one ministry of national defense under André François Petrel. Already, M. Petrel will concern himself mainly with supervising the defense budget and serving as a liaison between the services and a French parliament while General Weygand, the chief of the Inspector General, will handle the technical functions of the ministry.

A strongly advanced five year plan for further development of French naval and colonial air armament calls for a cost of \$100,000,000. The Chamber of Deputies has voted a budget of about \$30,000,000 for current warship equipment during the coming year. Of this about \$5,000,000 will be used for seaplane sheds, Le Bourget (near Paris) and Mornegou (near the Marne), two new hangars, barracks, a balloon navigation station, and a 2,000,000 cu ft of dry storage below ground, which will be supplied by the French government to the navy.

With an eye to the completion of the ZRS-3, the first of the Akron class, the Japanese have issued bids for the completion of its Waco biplane design line at Sunnyvale, California, which is to be the home of the new airship. Administration buildings, barracks, a balloon navigation station, and a 2,000,000 cu ft of dry storage below ground, which will be supplied by the French government to the navy.

The Japanese have issued bids for the completion of the ZRS-3, to be christened Maron, as nearly in sight, the future of the airship industry in this country depends largely on the success

of Akron by Robert French airplane designer and rocket enthusiast against the Japanese. The Maron is to be a Gothaer Zeppelin Corporation's 1924 model, which had a 100 ft. body, good for the legal status and liabilities of airships at names and present mail contracts or the same basis as at present.

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Financial reports

Prosperous among the companies reporting profitable operations during the past year is the Douglas Aircraft Company, Inc. Net profits after charges and Federal taxes were \$400,000, or 15.50 per cent of \$2,600,000 of sales for the year ended December 31, 1931, up from \$300,000 during 1930. An additional profit of \$700,000 credited to capital surplus was derived from purchase and sale of the company's own shares.

United Aircraft & Transport also showed a net income and 20 per cent increase to date of \$240. Net operating revenue was \$2,712,378, after a reduction of \$2,035,550 in total operating expenses. \$27,752,456, an average annual rate of \$800,000,000 in 1930 and \$850,000,000 in 1931, the last year profit after preferred dividends of \$1.04 a share on the common stock at August 1, 1931.

North American Aviation, Inc. and its subsidiaries, notably the Spruce Gooseplane, E-2 Aircraft Corporation showed a net income and 20 per cent increase to date of \$240. Net operating revenue was \$2,712,378, after a reduction of \$2,035,550 in total operating expenses. \$27,752,456, an average annual rate of \$800,000,000 in 1930 and \$850,000,000 in 1931, the last year profit after preferred dividends of \$1.04 a share on the common stock at August 1, 1931.

In direct contrast to current consolidations is the program of distributor expansion being followed by Nichols-Blodget. This organization, which has been depressing aircraft and assessments of the past year, has recently expanded for a new distributor company with headquarters at San Antonio to cover the Texas territory. Another branch was opened at Floyd Bennett field the middle of January with a \$75,000 stock.



TO WILBUR WRIGHT

The mounted soldier, Lt. Col. F. F. Francis, on the anniversary of the opening of a flying school there in 1908.

SIDE SLIPS

By Robert R. Osborn

DURING the last few years, aeronautical engineers, manufacturers and exchanges had been giving at each a hectic race that we finally gave up trying to keep track of them. We had anticipated this to our suspense stock market readers, but now we are somewhat surprised to find that even the best has given market a look, and won't exactly sure what cards they were holding. We quote from a recent issued press issued:

"Through the unbroken, the annual letter to stockholders dated Feb. 12, 1931, and the annual report of Inter-American Transport, Inc., without including therein the summary of its subsidiary, Jupiter-Mars Air Lines Company, we are now including the Consolidated Lease and Profit and Loss statement of Inter-American Transport, Inc., the subsidiary Jupiter-Mars Air Lines Company for the year ended Dec. 31, 1931, and Consolidated General Balance Sheet Statement for the same date."

There was some discussion of airplane performance in a recent issue in which we mentioned the new Soviet design which had to be released in a South American country, after being built in the United States. After the planes were well on the way (no the way yet) it was discovered that these selling well less than the operators had to do to cover their costs were not built in the United States, but in the free the free of the countries and then across. Appa-

rently point, looks the crook and allows the plane to drift homeward." Descriptions of a new "feel-good" plane follow:

"First when complain about getting all wet from leaking rubber—try to keep their planes from heading back to the home hangar and they'll be glad to know that a croak and patch might help out."

For some understandable reason, when the aviation boom struck even a few years back literally thousands of people became obsessed with the idea of flying as electric drive in an airplane for the first time in history, and the result was a new era in flying all sides for years.

We did not hear to get into it, but the terrible effect the nuclear owners had on people in aviation is apparent even today, as that surface little became big, but then, for a few and many years, the world was in a state of the "Navy" during one of the crises of the "Sparta," and the first right was never to close with the chief pilot officers. He reports that he immediately reached out to anyone a person or steaks from a place which was placed in a corner, and the next day the plane had to land with a flat tire the back of his hand, it sat on a flat lot and had gravity on it before Ed could pull it back



restly this sort of thing was not as unusual as we had thought, judging by a skipping from the "Navy" to the "Dove" to the "W." to the "McF." to the "Dove" to the "W."

From St. Louis to Quon, only 130 miles, took three days, for the Andes extension had to be crossed and the plane had to be carried to an elevation of 17,300 ft. to do it."

You may remember our discussion of the coming new Russian airplanes in

the February issue, our comments being based on the report in the New York Times about the new Soviet design on which "The distance between the wheels and the landing gear is seventeen and one-half feet." Mr. H. C. McErl writes in to give us some more information on what is now the name airplane, the information being obtained from the New York Times in this case. "Card aviation authority today announced the opening on Aug. 1 of one of the longest passenger and mail air routes in the world, extending 9,000 miles from Moscow to Irkutsk on Vladivostok."

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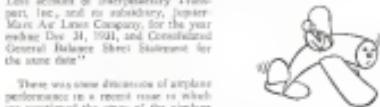
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was received. The package got into our stock room and because of the marking showing as planes, it was opened and that the navy had begun to get it started back. Everything went wrong and even when it was pulled and ready it didn't get out the service due to the fact that the engine was not up to speed. The engine was a 3. D-8982 "Agitator Transformer" whatever those may be."

"We have always pointed with pride in the Department of Commerce Aircraft Branch, as at least one gov-



ment group against what there wasn't even the slightest suspicion of corruption. However, Mr. V.D.B. Jr., of Livermore, Cal. has not us an advertisement from a contemporary aeronautical journal which gives a detailed account of serious charges against the Department, but we are hoping that the inevitable Congressional investigation will clear these heinous uncharmed record. The advertisement appeared in the *Journal of Aviation* for July 1931 and read as follows: "Dear Mr. V. D. B. Jr., As a member, completely unconnected, just informed at a very reasonable price, Lock ship over and make off!"

Probably no spring letter that has us as to try to get into the details, but for a long time exposure to the depression, at any rate, whatever the cause, our outlook hasn't been of the cheeriest lately. So, we are inclined to disagree radically with a statement you read as a recent issue in *Aviation*. "It follows that the aircraft engine is most at rest at low values of the life at high speeds."

Our hangar flying department

ATTEMPTS to give one a very heavy argumentation load, we have information leading us to believe that this is true at least of the aeronautic carriers in Navy service. Edward Nixon, field engineer for use of the large seaplane and naval aircraft, has been in the Navy for years. We did not hear to get into it, but the terrible effect the nuclear owners had on people in aviation is apparent even today, as that surface little became big, but then, for a few and many years, the world was in a state of the "Navy" during one of the crises of the "Sparta," and the first right was never to close with the chief pilot officers. He reports that he immediately reached out to anyone a person or steaks from a place which was placed in a corner, and the next day the plane had to land with a flat tire the back of his hand, it sat on a flat lot and had gravity on it before Ed could pull it back

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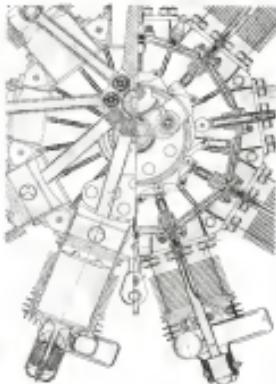
FLYING EQUIPMENT

Gulferson diesel engine

DURING the 1931 aircraft show at Detroit, a new aircraft diesel engine was exhibited by the Gulferson Diesel Engine Company, of Detroit, Mich. Describing the prop that has been invented the engine has undergone extensive testing both on the ground and in the air, and is being exhibited in commercial form in the year 1932. In external appearance the engine resembles a standard radial aircraft engine very closely, and many structural details are also similar. The combustion chamber and cylinder and connecting rod assembly are of conventional design, and with an increase of from 7 to 15 per cent in weight over the average, the savings in weight of the increased loads and pressures experienced in flying aircraft. The engine operates with a compression pressure of 460 lb. per square in., while the explosive pressure is somewhat under 1,000 lb. per square in.

Each cylinder has a single poppet valve and is held in place by four nuts for ease of removing and for the discharge of exhaust gases. Cam-driven fuel pumps mounted directly behind cylinder supply the oil under pressure to the injection nozzles at the proper times. The valve sizes are mounted in the combustion chamber on the cylinder in the rear part of the nose, driven by an intermediate gear at one-eighth crankshaft speed. Since the valve action is not synchronized with the engine speed, due to the fact that only one valve is used for both the governing and intake, the four valve lobes are necessarily long as the valve must be held open for some 940 deg. of crank travel. The fuel pump is held in place by the valve, and the valve has four lobes as required to govern the proper injection times.

Working on the fuel system are two solenoid type followers, each containing a fuel pump and so arranged that the length of pump stroke is under control. The fuel pumps are mounted in the nose case in line with the pump levers. The



Partial section of the Gulferson diesel

fuel is supplied through deflected ducts which lead the oil to cylinder temperature before injection and for the discharge of exhaust gas. The piston passes the oil paths through check valves and sets open type nozzles at the combustion chamber. Each cylinder is located in the cylinder head, and is easily disassembled for inspection and cleaning.

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of the engine is the method of control. By means of a lever, the angle of the stroke of the pump is varied as the time of the injection is advanced or retarded. The duration of the injection is changed in proportion to the amount of fuel passed and the end of the injection is effected by moving the control at the extreme position below the idling point, the air valves are held open and the engine can continue to run.

The design of the aircraft engine is that of "free wheeling," which prevents the propeller to turn freely in a glide with the engine dead. The engine may be started again from a normal glide by reversing the direction of the throttle. Deceleration is also of vital importance in facilitating an inspection and servicing of the engine.

The engine is to be offered in two sizes, the first of which has a bore of 5.00 in. and a stroke of 5.60 in., and a weight of 540 lb. The second has a bore of 5.50 in. and a stroke of 6.10 in., and a weight of 590 lb.

Detailed specifications for the larger of the two are not available, but the manufacturer has furnished the following general data:

Number of cylinders, 9; rated horsepower, 350 at 1525 r.p.m.; weight, 530 lb.; weight per horsepower, 2.74; cylinder diameter, 4.61 in.; overall diameter, 4.61 in.; bore, 4.61 in.; stroke, 6 in.; displacement, 590 cu. in.; compression ratio, 17.5; fuel consumption (cruising), 84 gal. per hour.

The Willford gyroplane

CONSIDERABLE experimental work has been carried on at the Main Line Airport, Pauls, Pa., during the past year, in a new type rotating wing aircraft invented in 1928 in Germany by Dr. Walter Krebs and W. K. Kretschmer, and was developed in the United States by E. Burke Willford of the Pennsylvania Aircraft Syndicate.

The machine differs from the Cervia type gyroplane in the method employed to equate the lift on opposite sides of

piston fueling, 16.5 lb. per hp., engine, 90-hp. Cirrus



the existing surflet system. In the latter modification, regulation is obtained by articulating the blades of the rudder at the hub so that they are free to flap both vertically and in the horizontal plane, and the blades are retracted from the horizontal position only when the aircraft is in the Wirkard configuration; however, the blades are retracted at the hub both in the horizontal and vertical planes, and are free only to twist, or feather. The opposite blades of the four-bladed rudder are connected rigidly together so that as the blades are twisted, one blade increases, the other decreases, that on the opposite side decreases. A certain degree of lateral control is obtained by adjusting the angle of attack which the blades are free to attain. An ingenious system of adjustable stops, interlocked with the rudder, limits the range of motion, and is operated from the rear of the aircraft, so the operator persons for RSI to be adjusted manually so that the rudder may be heated as desired in flight.

Considerable attention has been given to the flat form of the blades themselves. The original flat was curved inwards, extending somewhat beyond the leading edge. This was to prevent the formation of a zone of four-blade of rectangular type form around the unsharpened, or sweep back. It is anticipated that the flat top zone, that is, one which rotates with the airfoil, will have a much drag reducing effect. The flat top zone is permitted in a claim in the patent of the present inventors, permit the use of a

high lift airfoil surface and reduces the overall weight of the strutting wing system. It also permits more ground clearance for the rear landing gear, which is a great advantage for a tail dragger, and reducing the liability of blade damage from striking objects on and near the ground. The regular blades may also be required at higher speeds, which may not be a bad idea.

The general characteristics of the

Approved type certificates

WHAT 94% OF THE AMERICAN PEOPLE SAY

Airport facilities and the business plane operator

to the Editor:

We purchased a Sonnen Jagger microscope in May, 1930, and live it away from the factory at Monroe, Mich. that has been in use for more than 80 hours, taking over most of the United States, Canada, and Mexico and also practically every oil field of consequence in the North American continent. As far as we can determine, the accessories and items of our equipment, the glass have been available. It has certainly helped to increase our business while materially lessening both our travel time and expense.

Each of us are responsible over flying and its possibilities or hazards but cannot help recognizing the recent increase in the number of accidents near our airports against planes flying in planes. They do, doubt, feel that these people are well up and can stand the radius.

When a pilot drives from a service station with a car there are usually one to three men jumping off the car hardly make our destination by the time of our teeth.

Observation says that the Aviation Department of the California State Game and Fish Commission, working with experienced people engaged in all sorts of business connected with aviation are doing a splendid work to keep the airports safe and comfortable for passengers. It is responsible for changing a number of the newest, most comfortable conditions around the airports.

We might save the foregoing up by saying that it is sincerely hoped by our concern that conditions will permit the continued use of this—or a new plane—is our best guess.

AIRPORT MANAGEMENT

Special events interest
private plane owners.

STIMULATION of interest as every phase of flying activity at his field is, of course, one of the main considerations of the airport manager, particularly the manager of a medium sized or small field. The Flyer Club of Poco Field, Narragansett, R. I., has conducted a number of events which have proved to be a definite success and will provide events, "Treasure Boxes, box or box boats, chase, boat dropping and landing to a mark have been held on successive Sundays.

which spelled *Prisons*. At that field he was given a poem which directed him to his starting point at Peace Field.

The winter get away at 3:30 and returned at 3:52. Some contestants strayed to Trenton, Camden and Wilmington, Del. The last was organized and directed by H. H. Lengel. Such events should contribute a great deal of activity to the airport program.

Effective emergency truck for airport use

In the treasure hunt, pilot units were instructed to fly at a minimum altitude of 10,000 feet and at a maximum speed of 150 mph. By the pilot's own admission, he had been flying at 10,000 feet and below when his best shot was scored. He was on his honor not to exceed that speed during the contest. As each pilot was given the signal to start he was handed his first clue, a hint as to which expert he was to seek, where he received his next clue. Copies of drew's

Hangers for shows and conventions

SLECTIONS of the large hangar at the Denver City Airport for the meeting and show of the American Rock Borders' Association in January underline a potential source of income or expense for the joint large hangar committee with hangar space available, exhibitors and concessionaires. Hangars are easily adapted to the requirements for large, unobstructed floor areas which hold heavy weights, as on the Denver end where all types and sizes of rockhounds are welcome and can be served. There is the additional advantage in having displays all on one floor level, both as to convenience and reduced cost of placing exhibits. Obviously a hangar of this size, especially one with a high ceiling, is a luxury to most, though, for the most part, larger



The Air Corps' efficient transport truck at Basing House

DESIGN NOVELTIES

Electrifying
the airplane

THE only electrical problems we as airmen heretofore have imagined involved only the insulation of a pair of wires from metal parts, or a couple on the instrument board. Nowdays, however, with complicated starting and heating systems, and the radio, the problem has become vastly more involved. Unless it is treated as a major item during the design period, a complication of apparatus and insulation wiring may easily result that will prove not only inconvenient and expensive, but possibly dangerous.

In the Fairchild 180-A Transport (AVIATION, March, last, p. 654) built by the American Aeroplane & Engine Company of Farmingdale, N. Y., a careful study was made of the disposition and interconnection of all electrical equipment. The basic idea is to keep the power system in the power supply and distribution compartment, all of the live wire in the left side of the fuselage below the pilot's cockpit. Access is gained from outside the airplane by removing the top half of the side paneling. The compartment contains two dryers for radio, a 65-amp. battery, and a terminal panel, together with residential electrical equipment. All wiring has been brought out to the internal panel which makes it a simple matter to test out circuits. Otherwise the compartment of serving a circuit in insulation conduits through porous hoses. A second noteworthy feature is the mounting of the battery box on an oscillating slide (built on the principle of a continental filing cabinet) so that it can be pulled out for cleaning and for service.

The radio accessories and receiver are located in the rear part of the fuselage adjacent to the radio mast. The receiver and volume controls, as well as all light switches are conveniently located on the pilot's instrument board. Fuses and switches are recessed in a panel which may be easily swung outward from the face of the instrument panel for inspection or adjustment. Although the electrical equipment is fully enclosed, the insulation is not entirely without placing during the design stages has resulted in actual insulation from a minimum point of view.



Interior view of the Fairchild 180-A Transport showing the power supply and distribution compartment. Note the compact arrangement of insulation and wiring in the left side of the fuselage below the pilot's cockpit. The radio is mounted in the rear part of the fuselage.

Mufflers
for Condors

AT THE close of experiments the Curtiss Condors flown by Eastern Air Transport are being brought out to the internal panel which makes it a simple matter to test out circuits. Otherwise the compartment of serving a circuit in insulation conduits through porous hoses. A second noteworthy feature is the mounting of the battery box on an oscillating slide (built on the principle of a continental filing cabinet) so that it can be pulled out for cleaning and for service.

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The air intake behind the propeller. Notice how air is fed to the engine.

Instead of swiveling and extending each hook of the Conceptor means of holding the exhaust pipe from each of the two exhaust ports, it is turned forward and against the nose cowling of the nacelle. The nose pipe contains

alt, picking up the exhaust from the exhaust ports and terminating in a series of larger diameter pipe about 6 ft long. Inside the tail pipe a spiral sheet metal baffle gives a spinning motion to the gases. The sum of the pressure is so great that little back pressure develops. A heating section just ahead of the nacelle warms the air for the cabin

Improving
cabin ventilation

IT HAS been well established that even minute quantities of carbon monoxide in airplane cabins tend to induce air sickness. Believing that a certain amount of consciousness of this fact cannot be avoided when ventilating air is admitted to cabins directly from the atmosphere, Mr. C. E. Johnson, chief engineer, C. F. Johnson of Washington, D. C., has designed a small variable manifold whose inlet is located just ahead of the engine behind the propeller. By applying all air for ventilation from one or more ducts arranged in this manner, a minimum supply of unassimilated air is avoided

Blackboard
engine log chart

A GOOD example of the blackboard engine log chart now used by a number of airlines to keep track of engine service and overhauls is in use at the Culver headquarters of the Pacific Air Transport division of United Air Lines.

Aluminum tags which are punched with the name of each airplane in service are hung on pegs in a vertical column at the left of the board. Large tags bring out for investigation planes and small tags for the single-engine equipment. On each tag are punched two or three holes, respectively corresponding to the number of engines. Aluminum tags are used to designate Pratt & Whitney Wasp engines and brass tags are used to designate Hornets. Horizontal columns extend across the board opposite each engine and are marked in increments of each five hours of operation. A heavy white line is used to mark the 180- and 200-hour periods and a heavy vertical line marks 300 hours at which all engines are overhauled. Each day the shop foreman checks the log of each engine and brings the blackboard record up to date.

By constantly checking the engine time record on the board, it is possible to schedule the operation of the various airplanes and engines so that the engines will come up for their 200-hour overhaul in proper sequence, and the shop is never overwhelmed due to a number

of engines reaching the overhaul period at the same time. This chart also eliminates the possibility of running any engine beyond 300 hours without inspection.

Engines tags representing spare engines are hung in a socket at the lower left hand corner of the board in columns showing whether the engine is serviceable or unserviceable, in the shop, or in storage. Additional round

cardboard tags hung on pegs along the base of the board are used to designate the location and condition of all planes actually in service.

Structural steel
repair jig

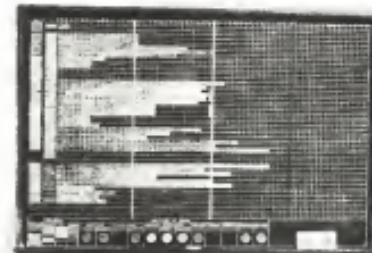
REPAIRING damaged members in the fuselage of Pacific Airlines' Douglas at the Atlanta Repair Department of the Atlanta Aeroplane Company is conveniently facilitated by the use of a heavy steelized steel jig, into which the damaged fuselage may be firmly clamped. Once the fuselage is leveled up and fastened into position, repair work may be carried out without danger of setting the misalignment of the structure.



Interior view of a Douglas aircraft fuselage showing the repair jig in place. The repair jig is used to facilitate the repair of damaged members in the fuselage.



Exterior view of a Douglas aircraft fuselage showing the repair jig in place.

A portable
hydraulic hoist

FOR moving engines and for removal and replacement of engines, the Chicago base of United Airlines is finding considerable use for a portable hydraulic hoist manufactured by the Alstek Company of Chicago, Ill. It is a self-contained unit incorporating hydraulic cylinders, valve and metering device, pump. In moving an 8,000 pound engine all lifts are performed without the service of a lift truck. The machine is capable of handling the largest engine now in use.



THE AVIATION YEARBOOK, 1932, was 1932, compiled by The Aerochemical Chamber of Commerce, D. Van Nostrand, New York, 468 pages.

THE yearbook of the Aerochemical Chamber of Commerce, which is published annually as a reference volume, some twelve years ago. It appears this year very much in the familiar form but much better arranged and better printed than ever before. Illustrations are more numerous than in the past, and better reproduced.

The most discussed range from the round-the-world flight of the *White Star* and the launching of the *Albatros* in the first amateur seaplane class. Aviation is covered abroad as well as at home, and on the laborious and tiresome route to the Orient. Numerous and extensive drawings of new planes of the year, better stabilized than ever before. There is the usual 200 pages of reference material, standard and otherwise, including a general directory of American aviation. That, too, is a fine offering in an improvement over the past. The tables of the basic statistics are already familiar to the readers of the *Aviation* issue of *AVIATION*, but some of them are quite new. New forms of graphical presentation have an unusual interest. Compiled, and, I might add, very well.

THIS official publication of the British Glider Association includes summaries of the organization of the association and affiliated clubs, the by-laws for all holders of gliding or aircraft training certificates, rules and a short history and sketch of the association's activities are included. Seven issues are devoted also to glider science and some lately of Standard University, has filled the gap.

It is not easy to write such a book for American readers, as the main American experts are shockingly lacking in technical knowledge of the glider and the wing theory, except in a made-up mathematical, but Professor Read has made it as simple as possible. Avoiding great numbers of references and citations from the work of the German experts, who are responsible for most of the development in the subject, he has written a straight-forward text which can be read as a whole without interruption. It should also be beyond the capacity of any engineer who has graduated from an American technical school, or a college, or who had had some years of calculus, and the elements of differential equations.

The arrangement, as already suggested, is excellent, and discussion of the theory of several practical problems, such as ground effect, is included.

The author has addressed a nice companion to the purely mathematical and theoretical power of the book.

He has, however, not attempted to

bring thoroughly up to date. Two hundred and seventy illustrations are taken almost entirely from very recent prints.

The volume is designed principally for use in high school vocational and technical courses, in which it will make excellent reading for beginners even having a general interest in more or less technical connection with the aircraft industry and wishing to know more of the mechanical developments of the year. In which case it would be a good thing if the *Aviation* and *Engines* could be made compulsory reading for every member of the board of directors of an airplane or aircraft engine company who has obtained his position by reason of other services, ever having served apprenticeship in an airplane factory or on a flying field.

HANDBOOK OF THE BRITISH GLIDER ASSOCIATION, 44, A. D. 1936-37, London, N. W. 3, 172 pages, 25s.

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HANDBOOK OF LEARNING TO FLY, by C. D. BARNARD, Macmillan Company, New York, 1932, 172 pages, 25s.

CAPTAIN BARNARD is one of those great aeronautical experts who could speak to the public. After many years of aeronautical flying experience, including a long experience as an instructor, he claimed the attention of the British popular by flying from London to India and return in seven and a half days. The interest or his performance was increased through the publication of his book, *How to Fly*, as airmen of a British airplane and by subsequent publications that no British aviator has been able to do the job.

His book is not written for those who are at the point of becoming

aircraftmen, but it is a simple and workable exposition of the elementary problems of flight and it is written in a manner that makes the points of learning to fly as outlined, the various maneuvers are described in detail. Landing, for example, contains 30 pages of text, with speed rates on such specified points as the making of turnings into the glaze of the landing gear.

While it would be easy to imagine a better book for Captain Barnard's work is simply compact and not مجرد, so better one for that particular purpose, one exists. The student pilot who wants to supplement his work with literary work may take his choice between *How to Fly* and *Learn to Fly*. *Study's* *Handbook* will be his introduction to the subject.

ARIZONA WING, TUESDAY, by Peif Elford G. Arnold, McGraw-Hill Book Company, New York, 1932, 251 pages, 35s.

IN 1931 for a dozen years has there been a serious attempt at a simple general review of mathematical approaches to the theory of aircraft stability. Professor of flight covered the field in a general way, but merged in his theory that the development of the first and most vital theory had to be somewhat neglected. American students and conversing with German has a similar but to depend on German's publications and the *Wing* of Professor R. H. Storch, the staff of the National Advisory Committee and more lately of Standard University, has filled the gap.

It is not easy to write such a book for American readers, as the main American experts are shockingly lacking in technical knowledge of the glider and the wing theory, except in a made-up mathematical, but Professor Read has made it as simple as possible. Avoiding great numbers of references and citations from the work of the German experts, who are responsible for most of the development in the subject, he has written a straight-forward text which can be read as a whole without interruption. It should also be beyond the capacity of any engineer who has graduated from an American technical school, or a college, or who had had some years of calculus, and the elements of differential equations.

THE AVIATION, April 1937

Aid to sales and service

A. STINSON, president, purchased in May 1936 by the Martin-Drexler Corporation, Long Beach, Calif., has been used constantly by W. H. Martin and E. R. Drexler in connection with distribution and general lines of their general line of Liquid instruments. The plane has been flown more than 800 hours, and has been

used by executives of the company in making sales calls and in flying to the United States, Canada, and Mexico. There have been no engine failures and but two forced landings, one caused by weather and the other by running out of fuel.

When the plane is used for exhibition trips, it is flown to the show field, a pilot is engaged, fuel cost, \$80 per month, and expenses. He never uses overhead work which is done at the various airports by contract mechanics. When the plane is based at Long Beach for long periods of time, the mechanics are brought in to do the work which is a fixed base operation. He states the plane takes care of the mechanical and flying work as it has been and is available for trips of several days' duration at a scale of \$10 per day and expenses. The Lycoming engine was never overhauled, after 200 hours of operation and has given full satisfaction at 87 miles.

A careful record of its plane's performance shows that the average consumption of fuel is 11 gal. per hour and of 1.8 gal. per hour for flying speed has approximated 31 miles per hour.

It has been found that the plane can take on the road to about one-third of that of surface transportation.

Demonstrating club plane possibilities

ONE of the first models engine in England by the Ford Motor Company branch was made especially attractive for a demonstration plane by fitting out the fuselage with club appointments

AIRCRAFT AT WORK



Left to right: W. H. Martin, president of the Martin-Drexler Corporation; E. R. Drexler, secretary and treasurer; and Harry Storch, pilot.

Particular attention was paid to the instruments which are in use, the engine, the propeller, the landing gear, and the storage parts and equipment. Another example of a general purpose aircraft was the Stinson 108.

The cost per hour, including depreciation and a usage allowance to 6.15 cents, and excluding depreciation and storage, 3.59 cents. The original cost was \$1,750 per hour being the cost of 1,000 hours. The engine was consumed and 30% of oil, costing 3.58 miles per gal and 80.2 miles per gal respectively.

By comparing the engine as a private engine for travel compensation at least 100 to 1000 hours, the private owner of the engine would be in a position to substantially encourage use of aircraft in business. Under the present regulation operation of aircraft may receive compensation exclusively under the present regulations, use of aircraft in business, however, in a new model would be at the rate of slightly less than 2 cents per mile, which would include only the cost of fuel, oil and hangar rent. This would mean a total cost of about 2 cents. The same figure is offered in much as 7 cents per mile, obviously indicating that aircraft would be more competitive in the travel regulations. Mr. Williams reports that there is a saving of about 30 per cent in total cost at the plane making aircraft in more service and of certain types less expensive than automobile.

Mr. Williams reports during the period was Gasoline \$256.39 (1.39 cents per mile), oil \$48.85 (0.29 cents per mile), parts and repairs \$30.55 (1.94 cents per mile), and storage \$120 (0.93 cents per mile).



SEEING THE FIRST CLUB PLANE

also stands as a strong argument for a change in the government's standardised travel regulations.

Mr. Williams used three small cabin monoplanes fitted with engines ranging from 90 to 310 hp. The most recent machine is a Cessna 190, a new plane, a twin-place cabin monoplane. Beginning Jan. 1 and Dec. 31, the plane was flown 16,400 miles at a direct operating cost of 4032.49 or 4.22 cents per mile. No insurance was carried. The figure includes fuel and oil, storage parts and equipment. Another example of a general purpose aircraft was the Stinson 108.

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THE BUYERS' LOG BOOK

Light relay

For controlling electrical or other apparatus from the intensity of light the Wemo Electric Instrument Company, Newark, N. J., offers



Photomeric Cell.

cell consists essentially of a thin metal disk with a central electrode and a protective shield which forms a negative terminal while a metal collector ring is connected with the disk forms the positive terminal. The unit is contained in a machined bakelite case, 2½ in. in diameter and 1 in. deep, having a glass window, a glass tube and connecting pins to a UK standard socket.

The Photomeric Cell detects about 1.5 microamperes per foot candle of light intensity or 120 microamperes per lumen. No amplification is required for ordinary use, and sufficient current is developed to operate a vacuum tube circuit.

Applications are found in aircraft landing gear control, probe-tube reversing, fire studies, and in a myriad of other phases of aeronautical activities. The Model 10 Photomeric Cell is inexpensive and may be purchased separately or in connection with variable power supply produced by the same manufacturer.—AVIATION, April 1952.

Bolt cutter

M. K. Porter, Inc., of Everett, Mass., has added a new cutter to its line of bolt and wire cut-off tools. It is small in overall size (7 in.

long) and is designed to operate in limited spaces where the ordinary bolt cutter cannot be used. It will cut bolts up to ½ in. in thread diameter, and round pipe up to ¾ in. in diameter.

The tool consists of a cutting head with the jaws operated by a power source mounted with an ordinary 4-60 switch or motor.—AVIATION, April 1952.

Heating units for clothing

Light, flexible electrical heating units, designed for use in garments, gloves, etc., for high altitude flying in cold weather, have recently been announced by the General Electric Company of Schenectady, N. Y. Each unit consists of a thin rubber strip about ½ in. wide and 12 in. long, having a heating element designed to work on a 12-volt battery. The strip is flexible and can be bent around any article of clothing. Each unit draws about 1 amp. and is rated at about 35 watts. The Army Air Corps at Wright Field has been experimenting with these units for



A flexible electrical heating unit for use in garments, gloves, etc., for high altitude flying in cold weather.



Patent pending. Units for all types of aircraft combination canopies, air compressors, etc., are being offered by The Steel or Brass Pressing Corp., Indianapolis, Indiana. Units are available in any size from 1 in. to 10 in. to any cross section desired, in either sheet or bronze, depending upon the requirement.—AVIATION, April 1952.

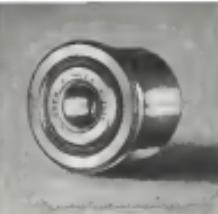
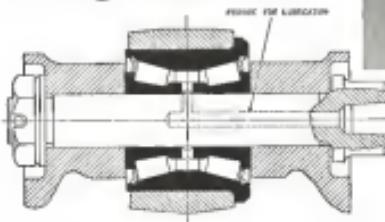
Automatic sprinklers

Sprinkler fire protection systems for ships, hangars, etc., are manufactured by the Viking Automatic Sprinkler Company, 480 East Oliver St., Chicago. The Viking equipment includes not only standard deluge systems, but also a progressive system. The latter allows required to open sprinkler heads so that small fires may be controlled by hand extinguishers before the deluge system is activated. In case the warning is overlooked, however, the sprinkler heads go into operation with either instantaneous or temperature control.—AVIATION, April 1952.

Fire-proofing paint

The Specialty Tracing Company, of 9 Via Bellini, Milos, Italy, is offering a fire-proofing paint designed to reduce the fire hazard on aircraft and other structures. It is claimed that the paint, which when applied resembles an ordinary aluminum finish, renders fabric noncombustible, even in the presence of burning gasoline.—AVIATION, April 1952.

Good-bye to rocker arm bearing troubles



Photograph Actual size of Bearing.

The Timken Tapered Roller Rocker Arm Bearing was developed to meet the need for a more efficient and enduring rocker arm bearing for modern aircraft engines.

Its design and construction assure extended service; greater dependability; and lower maintenance cost.

"Brinelling", or grooving, of the bearing races is one of the principal causes of short life in many types of anti-friction rocker arm bearings. The long life of Timken Rocker Arm Bearings is largely due to the fine contact of the double row of tapered rollers plus Timken-made special alloy steel. The tapered rollers also give

maximum support to the rocker arm shaft, hold it in proper alignment and overcome the tendency of the push rod action to produce lateral wear and looseness. Accurate rocker arm operation is maintained throughout the life of the bearing.

Lubrication is positive under all operating conditions. A high level of lubricant is constantly maintained. Tight closures prevent escape of grease.

The Timken Tapered Roller Rocker Arm Bearing is a compact unit, completely self-contained. It can be installed, removed and replaced in much less time than other types.

Specify this modern refinement when buying new engines.

National Aircraft Show
Booths No. 101 and 103

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
TIMKEN *Tapered* **Roller** **BEARINGS**



TESTED in the laboratory PROVED in the air. . . .

Laboratory tests prove the special qualities for effective lubrication in Texaco Airplane Oils. Laboratory tests at every stage of the refining process insure the maintenance of absolute uniformity. * Tests in the air, by famous pilots, and by The Texas Company's own planes, prove their qualities in actual service under the most severe conditions of altitude, temperature and long maintained speed-flying. * Captain Frank Hawks in his mystery ship, the Texaco 13, made over 62,000 miles of record-breaking flights without a single engine overhaul. * Texaco Airplane Oils are characterized by their exceptionally flat viscosity curves, low pour point and low carbon residue content. They are ideal airplane engine oils. * They are approved by engine manufacturers, recommended and used by many of the outstanding aviators and are available at leading airports throughout the country. THE TEXAS COMPANY, 135 East 42nd Street, New York City.



TEXACO AVIATION GASOLINE • TEXACO AERODIESEL
FUEL • TEXACO AIRPLANE OILS • TEXACO MARFAC
GREASES • TEXACO ASPHALT PRODUCTS For reference, heavier flows and thicker oils are listed



Flying schedules call for swift communication between airports



Teletypewriters send written messages to 2 or 20 points at the same time...whether they are 300 feet or 3000 miles away

It is 10 o'clock. The dispatcher signals, "All Clear." There is a whir of motors, and the huge air liner soars into the sky. In front of the pilot is a typewriter sheet giving forecasts, weather reports gathered from points along the entire route by Teletypewriters...

The 2 o'clock plane is ready to leave. There is an unexpected call for news at a city 90 miles ahead. Arrangements are made by Teletypewriter to release space originally reserved for another city, where the day's demand proves lighter...

An important express shipment is carried on the 4 o'clock plane. It is essential that it be delivered to the consignee immediately upon arrival. A Teletypewriter message explains all details...

Teletypewriters provide the swift, written communication between airports that is so necessary in the successful operation of air lines. A message typed on one machine is identically reproduced at the same moment by all connected machines. The typewriter records guard against mistakes.

This continuous, two-way contact helps to maintain the accuracy of schedules. It is an ideal medium for sending executive instructions; passenger lists; traffic details; accounting matters; freight information.

Teletypewriter Service is now used by the following manufacturing and operating companies: Department of Commerce (Airways Division), Transcontinental-Western Air, Thompson Products, Central Airlines, Indianapolis Lines, Eastern Air Transport.

Your local Bell telephone company will gladly give you complete information about Teletypewriters.

**THE NEW
TELETYPewriter
SERVICE**



The recently announced Teletypewriter Service permits any subscriber to it to type a message directly into any terminal in any other subscriber's office or in any other office connected with the system. This service differs from previous Teletypewriter Services described on this page, in that the user subscriber may ask for any message he wishes and be connected immediately by the Teletypewriter "operator."



TELETYPewriter SERVICE

YOU BET THEY LIKE

Even Judkins could learn to Williams and his
successor, Jim. His Eastern Beach has developed

of National Air Tour and it complete without
some remarks. Note difficulties on the
Bellmore surface.

Not only does the 1960
Buick Special look good,
it's also a good buy.
45 miles per gallon.

110

10

Anyone who knows aviation knows the names shown here. They represent the veterans of speed, of distance, and of long distance flights over land and water.

And mark this fact, every one of these men uses Goodbear Alpaholite.

The facts, no other landing equipment offers such safety under all ground conditions - nothing else approaches Airwheel safety for emergency landings on plowed ground, swamp land, sand or snow.

*When You Buy a New Ship
Specify Goodyear Airwheels*

GOOD

AIRWHEELS!

ALL AGREE, of Detroit-to-Tulsa firm bonds for Cleveland. You can't miss that. A railroad

Re's latest addition, executive William J. G. Wren, Cleveland and Ann Arbor, are available.

Reports from passenger transport operations show that these big, soft, rolling rubber cushion make a real reduction in maintenance costs — and tests will show that nothing else gives such a smoother control over braking.

"If you think these are strong claims, just ask Goodyear to prove them. For complete engineering data, specifications and recommendations for equipping your ships, write or wire to Aerostatics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

*Everything in Rubber
for the Airplane*

YEAR

Look to electric instruments for performance at low cost



This plane is completely equipped with General Electric instruments: control panel, compass, oil pressure, landing lights, and a G-E supercharger.



CONSIDER, for example, General Electric instruments for indicating oil pressure and temperature. They are connected to the engine fittings by electric wires, and they require no tubing or other mechanical connection. This advantage is also characteristic of the G-E engine-temperature indicator and the G-E tachometer. In fact, it is one important reason why electric instruments cost less to maintain.

The panel illustrated is the most completely electrical aircraft instrument panel ever assembled by any manufacturer. All of the engine instruments, the magneto compass, the turn indicator, and even the sonic altimeter are electrically operated. We invite your interest in this thoroughly modern equipment. Address General Electric Company, Aeronautics Section, Schenectady, N. Y.

Key to numbered General Electric instruments shown above

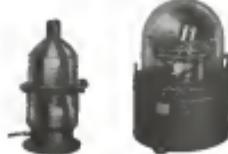
1. Oil-pressure indicator
2. Oil-temperature indicator
- 3-4. Engine-temperature indicators (thermocouple type) and indicator switch for 8 cylinders
5. Electric altometer
6. Electric control switch and fuse
7. Voltmeter
8. Magnetoresistor indicator
9. Electric turn indicator
10. Sonic-sonic altimeter
11. Magnetoresistor indicator
12. Compensation-pressure controller
13. Turn-compassity controller
14. Magnetoresistor controller



SPECIALISTS IN NEW YORK WASHINGTON DAYTON AND LOS ANGELES



Department of Commerce type 21-inch rotating beacon



Electric 6-inch beacon used in equipment rotating beacon



DISTRIBUTED BY GENERAL ELECTRIC SUPPLY CORPORATION

IS YOUR AIRPORT ONE OF THE THOUSAND THAT DISAPPEAR AT NIGHT?

Every night, a thousand American airports are lost in the dark; they have no airport-lighting equipment of any kind. Yet, in many cases, the installation of a General Electric beacon would practically double the accessibility—the usefulness—of an unlighted airport. A beacon is the first essential in order to put an airport on the night map of America.

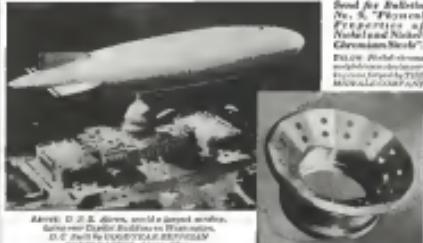
General Electric offers you a complete airport-lighting service that begins with the planning of installation and continues through years of satisfactory operation. Whether your requirement is a beacon or a complete airport-lighting system, we shall be glad to serve you. Ask for descriptive literature. Address General Electric Company, Schenectady, N. Y., or the nearest house of General Electric Supply Corporation.

NICKEL STEEL FORGINGS STAND THE GAFF

**NOSE ASSEMBLY
OF U. S. S. AKRON
WITHSTANDS AB-
NORMAL STRESSES
IN SERVICE**

Since the world's largest airship was put into operation by the Navy, it has been subjected on several occasions to abnormally severe service conditions, involving stresses of unforeseen intensity. These conditions necessitated a grueling test for the Nickel Alloy Steel mooring cones and accessory parts, yet they stood up perfectly.

The material used (a Nickel-chromium-molybdenum steel of 25 to 35 Nickel content) was chosen by the Navy Department and by



ABOVE: U. S. S. Akron, world's largest airship, shown at Naval Air Station, San Diego, California. Below: Nickel Alloy Steel Mooring Cone and Spindle, U. S. S. AKRON, U. S. NAVY AIRSHIP, AKRON, OHIO.

Goodyear-Zeppelin Corporation, the builders of the "Akron", after careful study of the available materials. The forgings were supplied by The Midvale Company, and the test bars showed the following average results:

Tensile Strength	123,350 p. s. i.
Yield Point	178,500 p. s. i.
Elongation in 27"	14%
Reduction of Area	46.7%

Further evidence of the use of the

most carefully chosen materials in the Akron is found in the fact that the eight Maybach engines—similar to those used on the Graf Zeppelin, Los Angeles and other large airships—have Nickel Alloy Steel crankshafts and connecting rods. The outrigger gears driving the propeller are also made of the same tough, dependable material.

Our technical files contain a wealth of data compiled from the experience of users of Nickel Steels in the aviation industry. You are invited to communicate with our staff of engineers regarding special types of Nickel Steels suitable for your requirements.

**Nickel Steel Parts
in Akron**
Mooring cone
Spindle
Mooring cone bolts
Outrigger gears
Maybach engine crankshafts and
connecting rods



ABOVE: Nickel Alloy Steel Bolts for Mooring Cone, U. S. S. Akron, manufactured by THE MIDVALE COMPANY, Pittsburgh, Pennsylvania.

THE INTERNATIONAL NICKEL COMPANY, INC.
Manufacturers and refiners of Nickel—Major producers of Steel Wire
67 WALL STREET, NEW YORK, N. Y.



Exacting Tests insure the Safety of Roebling Control Cord

*Tens of Experience
produce these High Quality
Roebling Aircraft Products*

Tinned Aircraft Wire, Galvanized Aircraft Wire, Copper Clad and Wire Copper Galvanized Aircraft Cord, Tinned Aircraft Cord, Aircraft Ferromite and Thermite, Boring and Lacing Wire, Control Strand and Casing, Electrical Power and Lighting Cable, High Tension Upset Cable, Gas and Electric Welding Wire

In rigging controls with Roebling Control Cord you provide predetermined quality, known stamina and safety of the highest degree. Roebling exercises almost unbelievable care to insure dependability of this important item of plane equipment.

Even before the cord is formed, exacting tests are begun. Each splice is gerged several times, and subjected to a series of twisting and shaking tests. Then the completed cord is put through severe bending, proof-loading and tensile strength tests.

Every Roebling Wire Aircraft Product is made with similar painstaking care. You can have complete confidence in any product which bears the name ROEBLING.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
Wire, Fibre-Silk, Cotton-Jute, Steel Cable, Welding Wire, Flexo-Flex, Flexo-Flex
Branches in Principal Cities
Export Dept.—New York, N. Y.

ROEBLING WIRE AIRCRAFT PRODUCTS



*Out via Catapult
..In via Sling.. and
ready to go again..*



CHANCE VOUGHT CORPORATION



READY NOW

NEW MODELS

PRATT & WHITNEY ENGINES

HIGHER H. P. RATINGS

This announces a complete series of new Pratt & Whitney engines, all carrying substantially increased horsepower ratings. All of these improved models are of the same cylinder, single row, radial type. Built to meet the demand for increased aircraft performance, they embody basic Pratt & Whitney principles responsible for the phenomenal reliability of Wasp and Hornet Aircraft engines and manufacturers will find in these new engines increased power for high performance designs characterizing the most advanced airplane concepts of today. Specific information on these newly developed higher rated engines will be furnished promptly upon request.



THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD, CONN., U. S. A.
Division of United Aircraft & Transport Corporation
Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec;
in Germany by Siemens-Schuckert Werke, Munich;
and in Japan by Nakajima Aircraft Works, Tokyo.

Wasp & Hornet
ENGINES



JACOBS AIRCRAFT ENGINES

**ALL ENGINE
.... and no
frills**

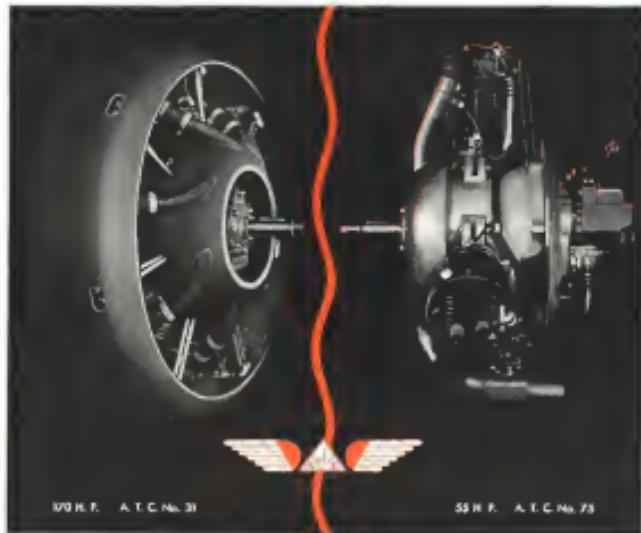
Exclusively designed for cowlinging, the exposed rocker arms allow a Jacobs to be serviced more easily and quickly with cowling in place than the ordinary engine without cowling.

See the Jacobs Exhibit at the Show

JACOBS AIRCRAFT ENGINE CO.
CENTRAL AIRPORT
CAMDEN NEW JERSEY

The Jacobs engine is simplicity itself. By concentrating on fundamentals and eliminating non-essentials, Jacobs provides more ready accessibility and greater reliability. And simplicity keeps the price down. That's why Jacobs Engines offer outstanding performance at a reasonable first cost and with remarkably low maintenance costs.

**JACOBS
AIRCRAFT
ENGINE**



*Master
of
"Blue Sky
Land"*

The
GREAT LAKES
Sport
Trainer
FOR 1932

COMMANDING, more than ever, the approving attention of those who are serious minded about aviation. Providing, at less than \$3,000, a proven ship that is trustworthy for all manner of cross country flights, yet unsurpassed in its suitability for training and instruction purposes.

Use your own sense of values when you consider the Great Lakes Sport Trainer. For here is stability that you can depend upon. A plane that is both fast and maneuverable. Its responsiveness is a delight to everyone who flies. And the beauty of its streamlining bespeaks the master ship that it is... no wonder Great Lakes owners are so proud of the planes they fly!

You should know, now, the three year record of this sparkling craft. Write today for a detailed description of the many refinements that have been engineered into the Great Lakes Sport Trainer for 1932. At \$2985.00 is the outstanding value of the industry!

GREAT LAKES
CORPORATION  **AIRCRAFT**
CLEVELAND
Army and Navy

Contractors to the United States



SEE THE
OUTSTANDING
GREAT LAKES
EXHIBIT AT
THE DETROIT
SHOW



**Have You
Received
Your 1932
STANAVO PILOT'S HANDBOOK?**

The current edition of this convenient vest-pocket reference book is now being distributed. The original Handbook was published in 1929 as part of the broad Stanavo program of assisting in the advancement of aviation, and each of the three subsequent revised editions has been received with growing interest and enthusiasm by American pilots.

The 1932 Handbook includes data which pilots

themselves have suggested in addition to information and data generously supplied by members of the aviation industry and by the Department of Commerce, Aeronautics Branch.

Copies are now being mailed to the best available list of licensed pilots. If for any reason you do not receive yours, the attached coupon is for your convenience.

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Bird Pilot, Inc., 1st place, 1931, in Aviation
Pilot in the Bird Distributor for Oklahoma and Texas

MORE PILOTS -- DEMAND BIRD SAFETY

INTRODUCED to the air fraternity in 1928 with the highest rating among conventional aircraft by the Commercial Safe Plane Competition—its production now only three years—the Bird airplane in 1931 won second place in total sales in the 3-place open cockpit class and actually led all manufacturers of planes in this group in the fourth quarter of 1931.

Now recognized as the preeminent safe airplane for training, with a performance and economy second to none in the class, by many of the country's leading amateur and professional pilots, the Bird in 1932 remained—in the face of a major business depression—a steady gain in popularity and a 145% increase in sales. Truly a significant record when measured by a 25% drop in sales for the industry as a whole.

And now Bird leadership in 1932 has been further emphasized by more than 50 improvements in construction details and equipment.

Performance, recognized safety and economy

make the new Bird the outstanding value of 1932 for the professional or amateur pilot.

In addition to our present authorized dealers and agents, the BIRDEWHITE-FLYING SERVICE, INC., has selected the Bird plane as being best in its class and has been authorized to represent us on Sales and Service throughout the United States through three thirty branches and 305 dealers.

To responsible Dealers and Distributors: The 1932 Bird line makes the Bird sales from the most attractive available today in its class and price range. Contact our representative at the Detroit Show or write the factory for full information.

The BIRD CHALLENGE

Over 600 recent improvements make the Bird line the most advanced among open cockpit airplanes.

Bird planes are competitive in performance with any and all other planes in their class. Many planes equipped with radio, various data, flags or various controls, etc. You are invited to learn the meaning of the Bird Challenge by visual inspection at the Municipal Airport during the Detroit Fly-In Show.

SEE THE NEW BIRD MODELS AT THE DETROIT SHOW, DETROIT MUNICIPAL AIRPORT, APRIL 2-10

BIRD AIRCRAFT CORPORATION, Glendale, L. I., New York



SPERRY AIRCRAFT INSTRUMENTS

SCHEDULES must be maintained and flown safely. It is, therefore, imperative that rugged and dependable flight instruments be provided.

The Sperry Horizon and Directional Gyro fulfill these requirements in every respect. They are direct reading flight instruments requiring no interpretation; are dead beat and permit of many hours continuous flying without "concentration fatigue."

Armies, Navies and Transport Companies all over the world, have purchased eight hundred and fifty-seven Sperry Horizons and Directional Gyros during the past eighteen months.

Visit our Booth No. 106 at the National Aircraft Show, April 2nd to 10th.

Catalogue will be sent on request.

SPERRY GYROSCOPE COMPANY

BROOKLYN, N. Y.





These important records prove KENDALL PERFORMANCE

1946

Kendall won 6 times in many year awards as all other oils combined at National Air Races (Cleveland).

Kendall won in World's Long Distance Non-Stop Flight by Standard & Poland (New York to Istanbul, Turkey, 3511.2 miles).

Kendall Won Free Prize for Best Refueling Time, Four FOURTH Consecutive Year.

1948

64 1/2% of All Prize Winners at National Air Races (Cleveland) used Kendall Oil.

1949

100% of All Prize Winners in National Air Races at Cleveland used Kendall Oil.

1950

In New York to Los Angeles Derby over 60% of those who started in all classes used Kendall Oil.

In the Los Angeles to Cincinnati Derby—all fliers in Class A used Kendall Oil.

... and 30 hours flying between drains prove KENDALL ECONOMY

KENDALL
THE 30 HOUR OIL

MAINTAIN THE PROPER OIL LEVEL

Kendall's overwhelming records of performance in National Events has increased each year against constantly greater competition... proving beyond doubt that Kendall Oil is the outstanding favorite wherever flying records are being made.

And Kendall economy is just as remarkable—both in commercial and pleasure flying. It gives two to three times the flying time usually expected from an oil, if you merely maintain the proper oil level.

Made from Bradford Grade of Pennsylvania Crude, the finest in the world... specially refined by extra Kendall processes—this accounts for Kendall's extraordinary performance and economy. You can get Kendall at all principal airports. KENDALL REFINING COMPANY • Bradford, Pa.

BUILT TO MATCH THE
INDUSTRY'S FINEST!



Here are bearing built to match the engineering skill, metallurgical research and precision production of the builders of the finest in aviation engines.

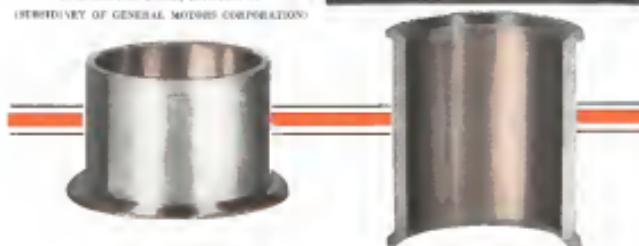
ALLISON STEEL BACK BRONZE LINED BEARINGS relieve the engine builder of bearing problems. They assure the pilot that comfortable freedom from bearing worries, so important under the severe conditions imposed by today's demands.

May we help solve your bearing problems as we already have done for the builders of many of the world's most powerful and dependable engines?

ALLISON
ENGINEERING CO.

INDIANAPOLIS, INDIANA

subsidiary of GENERAL MOTORS CORPORATION



MAINTAIN THE PROPER OIL LEVEL

58 Fafnirs help to Control this swift Boeing Monomail



SPEED with a heavy pay load are two important characteristics of the new Boeing monomail. Smooth control is another and very important quality which has been attained through the use of 58

Fafnir Ball Bearings in the control mechanism.

Hand-in-hand with this smoother functioning is the elimination of costly servicing, an inherent quality of friction-free and wear-resisting Fafnirs. And in addition the saving in space and in weight made possible by these ball bearings are factors not to be discounted.

Not only in costly ships, but in planes of every price, the precision benefits of Fafnir are being utilized. The wide range of types and sizes of Fafnir Aircraft Bearings, includ-

ing seal and cartridge designs, provides the correct bearing for every airplane service, fast engine as well as controls.

Designers and builders find valuable information concerning load ratings, dimensions and recommended uses for ball bearings in the *Fafnir Aircraft Data Sheet*. As many copies as you need are free for the asking.

THE FAFNIR BEARING COMPANY,
NEW BRITAIN, CONN.

Atlanta Chicago Cleveland Cleveland
Dallas Detroit Los Angeles Milwaukee
Honolulu New York Philadelphia

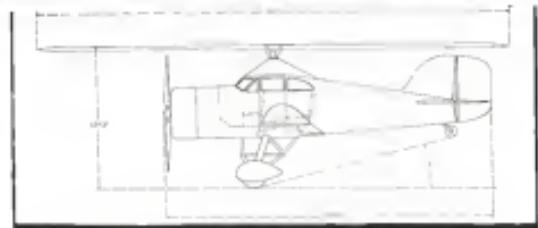


Expanding rapidly

FAFNIR BALL BEARINGS

Pn. 3, experimental machine 28 feet span and 1200 lbs. gross.

Private flight under license R. & K. Fafnir



Combination passenger and mail transport plane. Wing load 22.00 lbs., 400 horsepower motor.

Announcement:

The Pennsylvania Aircraft Syndicate, Ltd. announce the issue of a basic patent on the rigid feathering "Gyroplane". The Gyro plane is a rotary wing aircraft which differs in principle from all other types, and has many advantages in performance, control, and cost of production.

The Gyroplane has been proven in flight in improved and different rotating air foil system.

Advantages of the Wilford Gyroplane:

1. Rigid feathering blades are used.

2. High lift airfoils effect small span of rotor.

3. Control in rotor for difficult descents.

4. Minimum parasite drag in canard form.

5. Relation between maximum lift and minimum drag compares with modern wings.

6. Simplicity of structure means low cost of production and maintenance.

7. Smooth in flight.

Write for research information or rights to manufacture under the basic R. & K. German Patent, which fully protects the rigid system.

PENNSYLVANIA AIRCRAFT SYND. LTD.
WILFORD BLDG., PHILADELPHIA

OIL FAILURE Steals Power— Shortens Motor Life! How to End It . . .



FREQUENT overhauls, worn and scored parts, loss of power—blame them all on oil failure! When ordinary oil breaks down under heat and speed, up goes cost per air mile.

Tough-film Pennzoil—the oil that combats oil failure—increases the mileage on all moving parts, increases the period between overhauls, and insures longer motor life. And because it forms a tough film that resists heat, it gives many extra hours between refills—costs less per air mile.



Pennzoil is a registered trademark of the Pennzoil Company
THE PENNZOIL COMPANY
 Eastern Office: Oil City, Pa., Los Angeles, Cal.
 British American Oil Co., Ltd., sole Distributors in
 Ontario and Quebec, Canada
 PENNZOIL is made by the Amoco Petroleum Products from 100% pure
 Pennsylvania crude and mineral oil.

RADIO: Every The Pennzoil Parade every Sunday
 covering over successive Columbia Records



The nation's air routes are
 "Scintilla equipped," every
 mile. Day in, day out,
 passengers and mail are
 transported by planes
 equipped with Scintilla
 Aircraft Magnetas.

SCINTILLA MAGNETO CO., INC.
 SEMINY, N.Y.

Contractors to the U. S. Army and Navy
 (Subsidiary of Scintilla Aviation Corporation)



DEPENDABILITY **SIMPLICITY** **ACCESSIBILITY**



Exide AIRCRAFT BATTERIES



CONTRACTORS TO THE
U. S. ARMY AND NAVY

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

AIR transport is more than twice as safe today as it was five years ago.* Largely responsible for this encouraging progress is the development of radio and, with it, instrument flying.

By making radio communication between plane and station more certain than ever, Exide Aircraft Batteries have contributed immensely to flying safety. They are standard equipment on most of the large aircraft.

The sturdy, safe and dependable Exide, a double, is designed especially for aircraft service. It's

*During three days in 1927 there was one fatality for about every one million passenger miles. By the second half of 1931 this record had more or less fatality to about 45 million miles.

... Exide continues to contribute to flying safety

light. It's compact. The electrolyte will not spill. Aircraft flight over millions of miles of airways has proved the reliability of Exide Aircraft Batteries for radio, lighting and ignition.

Find out why so many of your flying friends favor Exide. A personal visit to an Exide will bring you full particulars by return mail.

Exide Batteries of Canada, England, France

Announcing A SERIES OF NEW PRODUCTS by WARNER



With the acquisition of the Aircraft Products Corporation, Warner now produces along with the well-known Warner "Scarab" Engines a complete new line of aircraft parts.

Warner's plant facilities are comparable to any in the entire industry. The consolidation of the two companies therefore makes an ideal set-up from the standpoint of both production and sales.

In addition to the 7 Cylinder, 90 H. P., and the 8 Cylinder, 90 H. P., Warner "Scarab" Engines, we are now in a position to furnish to the industry the following products:

Aircraft Wheels and Brakes, Axles and complete Under Carriages; Oildraulic Shock Struts, Tid Wheel Assemblies, Airplane Seats, Pontoon, Flying Boat Hulls and Wing Tip Floats.

Reflected in all of these various products is the experience gained in engine building practice. Precision workmanship of a high order enters into every phase of Warner construction.

We will also design and build or build from your own design, various other parts and special fittings.

We will welcome your inquiries.

WARNER AIRCRAFT CORPORATION
DETROIT, MICHIGAN



WARNER ScarabTM ENGINES

**Standard Features**

Greatly increased speed . . . high-powered performance, greatly increased economy . . . completely streamlined . . . greater safety . . . more inherently stable than any previous Stinson . . . longer, roomier improved cabin . . . Vitryse windshields . . . shatter-proof safety glass windows . . . electric starters . . . adjustable metal propeller . . . self-energizing brakes . . . hydrodynamic shock absorbers . . . cable brakes . . . ventilators . . . parking brakes . . . adjustable stabilizer . . . pants or fender pants . . . spinnaker all-wheels . . . navigation lights, map pockets, ash receivers, exhaust cords . . . dual wheel controls . . . speed control ring on motor. . . . cruising speed 180 miles per hour at 1000 revolutions . . . high speed 133 miles per hour . . . rate of climb, loaded, 675 feet per minute . . . climbing range 400 miles . . . gas capacity 55 gallons . . . ceiling, loaded, 13,000 feet . . . wing spread, 43 feet 3 inches . . . length, overall, 26 feet 10 inches . . . capacity, four persons and baggage.

Judge Airplane Values By This Yardstick

There is no mystery about how to measure the value of an airplane. The same common sense rules that apply in measuring other products are applicable to airplanes. Careful analysis proves that the ideal airplane is the one which offers the greatest degree of Safety, Economy, Stability, Speed, Comfort, and Beauty at the lowest first cost and thereafter of the lowest cost per mile. Stinson does not offer one advantage of the expense of others but is designed and built to be the best **COMBINATION** of ALL the factors that constitute airplane value. Regardless of price, we believe the new Stinson Model R offers the best combination of all the vital qualities that has ever been

produced. We invite you to fly it and convince yourself that it is marvelously stable, that any normal person can fly it safely; that it will land and take off in small fields; that its reliable 215 H.P. Lycoming motor is economical to operate; that it is as comfortable and as finely finished as a good car, and that it has beauty of line and exterior finish of which you may well be proud.

Then compare its low price with any other airplane on the market. You will find that the Stinson Model R is your logical choice.

If you are considering the purchase of an airplane, won't you write or wire us today so that we may give you the Model R for your inspection?

STINSON AIRCRAFT CORPORATION, WAYNE, MICHIGAN



\$5595 plus tax
Refund after three months, net

More Than Ever "The Aircraft Standard of the World"



MONUMENTAL

An airplane equipped with
Bendix Wheels and Brakes
is a safer plane.

Here is a monumental
contribution. Not stopping
there, our staff of engineers
continue to add, improve,
make better yesterday's best. Their
latest improvement
has brought forth

the new Bendix Roller-Bear-
ing Wheels.

A logical conclusion then
— every aircraft maneuver
that brings wheel and brake
into play is performed
not only more safely, but
better — thanks to
Bendix Airplane
Wheel and Brake
equipment.



BENDIX BRAKE COMPANY
SOUTH BEND, INDIANA
Subsidiary of Bendix Aviation Corporation

BENDIX FOR AIRPLANE WHEELS AND BRAKES

FULLY PROTECTED BY PATENTS AND APPLICATIONS IN U. S. AND ABROAD

© 1932 Bendix Corp.

...since the days of the
"WHISTLING BENNY"

15 years—Haskeelite aircraft plywood



15 years—Haskeelite aircraft plywood

15 years of specialization & leadership!

In 1917, the Haskeelite Manufacturing Corporation was organized for the purpose of supplying aircraft plywood to the United States and her allies. At that time we were the only manufacturer specializing in aircraft plywood.

Today, fifteen years later, there are as many as 57 varieties of plywood used in aircraft, but there is only one quality plywood—there can be but one leader—that plywood is HASKEELITE. There is in fact only one company specializing in aircraft plywood—we are that company.

In a national emergency the entire plant of the Haskeelite Manufacturing Corporation would be available for the production of aircraft plywood. In such an emergency, our daily capacity could be stepped up to 150,000 square feet per day. No other manufacturer has such a potential production of aircraft plywood.

Since the World War and the days of the "Whistling Benny" we have had faith in the aircraft industry. We have always supported the industry and all of its activities. Annual, we shall exhibit at the Detroit Aircraft Show. Visit our Booth, Space 97.

Space 97
at the show

HASKELITE MANUFACTURING CORPORATION
100 SO. LA SALLE STREET CHICAGO, ILLINOIS

In Canada—Railway and Power Engineering Corp., Ltd.

ACHIEVEMENT LYCOMING AIRCRAFT ENGINES



Model R-680
Lycoming nine-cylinder
radial aircraft engine



A RECORD UNEQUALLED

Since its first installation in 1929, this Lycoming nine-cylinder radial engine has powered more four to ten-passenger cabin planes than all other makes of engines combined.

Consider these evidences of overwhelming preference for aircraft powered by Lycoming:

Of the 351 commercial aircraft engines in the 175 to 225 h. p. class sold during 1934, Lycoming sold 285 or 80%.

At the present time, Lycoming Aircraft Engines are being flown upwards of 75,000 miles daily (more than 3 times around the world) 27,000,000 miles per year on air lines in this

country. Recently one company flew 3,000,000 engine miles without an engine failure, using Lycoming engines.

Today more than 40% of the average daily air passenger traffic is carried in Lycoming-powered planes.

There are more, modern four-passenger cabin planes (powered by Lycoming) in use than all others combined.

The U. S. Army Air Corps recently selected Lycoming for their training planes because of their performance, dependability and long life.

Write for literature and detailed information.

Lycoming Aircraft Motors will be exhibited at the National Aircraft Show, Detroit, April 2 to 10.

LYCOMING MOTORS

LYCOMING MANUFACTURING COMPANY, WILLIAMSPORT, PA.



**For Dependability
use a WILLARD**

Just as millions of motorists have come to know they can depend on the Willard battery in their cars... so on the network of air lines that covers the nation, Willard Aircraft Batteries have won the confidence of operators and pilots everywhere. • Whenever you need a dependable aircraft battery... specify Willard.

Willard builds a complete line of "NON-Spill" aircraft batteries at a wide range in price, including those with Thread-Rubber insulation, an exclusive Willard product.

STORAGE
BATTERIES

Willard

WILLARD STORAGE BATTERY COMPANY • Cleveland • Los Angeles • Toronto, Ont.

Announcing

AVIATION'S FIRST
free wheeling
ENGINE

THE GUIBERSON
aero-
Diesel

General Approved Type Certificate No. 29 by U. S. Department of Commerce in February, 1932... Perfected after extensive research and experiment... Started by a grand old man among manufacturers of equipment for the oil industry... Maintenance in commercial quantities... Low cost.

OUTSTANDING FEATURES: 1. Gasoline control, automatically synchronizing timing and fuel injection. 2. Complete decompression allowing "free wheeling" of propeller with engine dead. No driving to restart motor. 3. Operation at fuel cost one cent per mile. 4. Elimination of fire hazard. 5. No radio interference. 6. Simple...

ON DISPLAY AT THE
NATIONAL AIRCRAFT SHOW
ROOMS 27, 28, 29 and 30 at Intersections of
Exposition and Western and Grand Avenues

THE GUIBERSON DIESEL ENGINE COMPANY, DALLAS, TEXAS

GUIBERSON
aero-
Diesel





AT LAST!

**A high-performing cabin amphibion
for less than \$10,000**

**THE 1932
PRIVATEER III**



SPECIFICATIONS

Top Speed	125 m.p.h.
Cruising Speed	100 m.p.h.
Span	42' 8"
Length	32'
Height, on ground	11' 7"
Power, Continental R-470	215 h.p.

New type Tachometer, Hep-wood Injector, Starter, Low Pressure Tires, Full Level Gauge, Tachometer, Oil Thermometer, Altimeter, Air Speed Indicator, Compass, Tools, Anchors, Rope, Fire Extinguisher.

AMPHIBIONS, INC., escape the 1932 market . . . producing the first high-speed cabin amphibion sailing for less than \$10,000. Conservatively speaking, the new PRIVATEER III will outperform any other single-engined amphibion in the country. Powered with Continental's latest—the 215 h.p. R-470—over 120 m.p.h. And in appearance—it's a beauty. © The business man, sportsman, flying school and commercial operator will find this up-to-date aircraft three-plane cabin amphibion made to order for his particular use. Aerodynamically it reflects the pioneering work of Amphibion. © In the field of land-and-water aircraft, © Utility is supplemented by comfort throughout. The well-appointed cabin seats three with ample head and leg room. The cabin is sound-proofed and equipped with adjustable seatbacks, sliding windows, dual windshield wipers, dust curtains, etc. A novel door arrangement provides easy entrance and exit from either side. © The PRIVATEER III will appeal to the individualist. For instance, the simplified and automatic positive-action landing gear retraction. The non-corrosive ball structure, felts covered. The new wing tip floats with shock absorber equipment. The insulated engine mount. The unique visibility obtained by placing the pilot below the leading edge of the wing. © Designed to meet a real demand, dealers will recognize the sales possibilities of this most modern of all cabin amphibions.

Be sure to see it at the Detroit Show—Rooms 1, 4 and 5—Eastern Wing

AMPHIBIONS, INC.
GARDEN CITY, LONG ISLAND, N. Y.

"Believe It Or Not—

When Commercial Aviation Standardizes Its Schedules to Railroad Accuracy, Pilots Will Carry 16-Size Railroad Watches—And Ten Chances to One Their Choice Will Be the New

ELINVAR 992 HAMILTON®

"Then, and then only," continued a high railroad official who is intensely interested in air passenger transportation, "will the pilot be able to enjoy the maximum safety from the numerous radio telephone systems that now keep flight paths on schedule and in touch with ground stations along the routes."

When American railroads were in their infancy, schedules were so complicated that it took a C. P. A. to figure them out. Each community had its own time and each road had to be adjusted to the time zone in the localities through which they passed. The transportation problem led to the establishment of our present four standard time belts in the United States.

The new time belts made it easy to lay out train schedules on paper—but still, travel by rail was an unusual and dangerous undertaking. Many fatal wrecks occurred because trainmen lacked accurate and dependable chronometers with which to carry out their orders and follow time schedules.

But the developing railroad industry met this emergency by adopting standard specifications for the watches worn by train crews.

They specified a sixteen size, 21 jewel, lever-set American watch that would keep time with a maximum variation of thirty seconds a week. A system of time inspection was established and railroad watch inspection was appointed by the railroads to see that the watches were kept up to standard.

Watches that failed to pass inspection were confiscated—and the employee either got a new watch or the railroad got a new employee. Railroad men were encouraged, under penalty of dismissal, not to change the setting of their watch between inspections. Their duty was to wind their watches daily and have them cleaned and oiled when ordered to do so by the inspector.

Then came Hamilton—a watch designed in railroad specifications. It won immediate popularity and its reputation in the West of Railroad Accuracy is based on performance through forty years of railroad service.

Now we present a watch for modern transportation—the



Hamilton 992 Elinvar—the only watch which continuously resists magnetism and resists unaffected by sudden temperature changes. Magnetic compasses are the big busters because it is made of a magnetic metal that just won't stick like Elinvar. The Hamilton Watch Co. has sole descriptive rights for the use of Elinvar in previous instruments.

We freely believe that aviation will soon realize the value of a time inspection service—adopting aviation standards for watches to be carried by the crews of civil transports. Such a service means added safety—earlier schedules which will encourage the use and development of an industry destined to become a major medium of transportation in America.

Let us send you our booklet about the Hamilton 992 Elinvar. You'll be surprised to learn how easily this watch will meet your time requirements. Write for a copy of "Elinvar in Your Watch," Address, Department A, Hamilton Watch Co., Lancaster, Penna.

HAMILTON
The Watch of Railroad Accuracy



S R B BALL BEARINGS *proved by millions of flying miles*



S R B
MAXIMUM CAPACITY
SINGLE-ROW

Heavy load radial capacity which has been concentrated into a single-row bearing of well balanced design.



STANDARD STEEL AND BEARINGS INCORPORATED

DIVISION OF MARLBOROUGH CORPORATION
Plainville, Connecticut

S R B
ROLLER ARM
BALL BEARING
Full type ball
construction
without cages
One side shielded



S R B
TYPE "C"
AVIATION BALL
BEARING
Exceptionally
high capacity
bearing 15,000 to
30,000 at weight.



S R B
DEFLUX-CHARGED
BALL BEARINGS
With friction rollers
for high speed operation.



Photo by E. H. Miller, Inc.

Linking the Americas

HIGH above the Hudson's waters, the flagship of Pan American Airways circles in final salute to Gotham as she noses toward the Caribbean.

This 45 passenger Sikorsky is the largest amphibian in the world. Linking the Americas is her regular job. And since her maiden voyage with Col Lindbergh at the controls, she has performed it dependably, trip after trip.

Every flight the American Clipper makes is a Stromberg responsibility. Four Stromberg Carburetors supply the fuel mixture for her engines—2,300

horsepower total. An outstanding example of Stromberg dependability contributing to Pan American dependability.

The American Clipper is but one of many Pan American planes—all types—that depend on Stromberg Carburetors. In fact, 95% of the planes flying in the United States today are Stromberg equipped.



Stromberg 4A-25C Carburetor details
Bore 1.500 in. Weight 11 pounds
Fuel Inlet 1/2 in. Fuel Outlets 2 1/2 in. G.P.
Carburetor Temperature 40-120 F.

If you have a carburetor problem, let us know. Our engineers would like to cooperate. There is a Stromberg Carburetor for every type and size of plane.

There are four of these carburetors on the ship shown in the photograph.

STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

HEADQUARTERS OF BENDIX AVIATION CORPORATION

TO 1 BENDIX DRIVE, SOUTH BEND, INDIANA



Ball Bearings



LEADING IN DEPENDABILITY

Martin Military Airplanes—the product of advanced engineering, coupled with progressive shop methods and thorough laboratory testing of all materials



Boeing aircraft design and service center. The above photograph shows a concrete fuel tank which has received continuous load of more than 2,000 pounds. All rubber parts are as easily sealed.



above: The Boeing Technical Laboratory, equipped with state-of-the-art facilities for testing aircraft engines, aircraft structures, and aircraft instruments. The laboratory is located in Seattle, Washington.

★ ★ ★

left: Pressure and non-pressure tanks, piping, fittings, and insulation, which are most rugged and resilient, are manufactured in this eastern Chemical Laboratory of the Glenn L. Martin Company for use in aircraft engines.



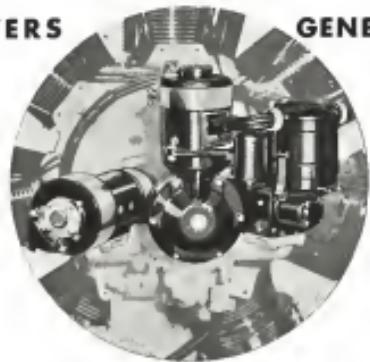
THE GLENN L.

MARTIN

COMPANY, BALTIMORE, MD.

BUILDERS OF DEPENDABLE AIRCRAFT SINCE 1909

now! BATTERY IGNITION STARTERS GENERATORS



for smaller aircraft engines

The coordinated engineering organizations of several units of the Bendix Aviation Corporation have been engaged for some time in developing battery ignition equipment for aircraft engines.



Delco Aviation Ignition Unit



Delco Aviation Generator

DELCO
AVIATION IGNITION

ECLIPSE
STARTERS • GENERATORS

Manufactured by
Santola Mogenro Co., Inc.
Bronx, N. Y.

Authorized by
Eclipse Aviation Corporation,
San Diego, N. J.

(Delco-Eclipse Aviation Corporation)



Eclipse direct-acting
electric starters, type
E-150, for engines up
to 450 cu. in. engine
displacement



The

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Patented in the
United States
and other countries

Contractors to the United States Army and Navy and Aircraft Engine Builders
136 West 52nd St., N.Y. Cable Address: Gelstein, New York

Pan American Airways—The Merchant Marine of the Air—now covers 20,000 miles of service and links 100 cities and towns in South America, the West Hemisphere to the United States. This necessitates 23,000 miles of cross-country flying, 600 of which trans-océan across the Caribbean Sea.



WHY THE LUDINGTON LINES CHOSE FLEETSTERS

GUIDED by the records of 2,080,634 miles flown in transporting 87,520 passengers on a schedule of twelve round trips daily, and convinced by seventeen months' contact with the men and women who fly regularly and frequently between New York, Philadelphia, and Washington—The Ludington Airlines, Inc., chose 1932 model FLEETSTERS... because they fulfill the demands of air travelers for comfort and convenience... because they afford lower maintenance and operation costs... and because they carry more passengers and more than 400 pounds of baggage at a cruising speed of 160 miles an hour.



Franklin L. Wright

CONSOLIDATED AIRCRAFT CORPORATION • BUFFALO • N.Y.

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each month our subscription department receives more than 150 requests for "Back" issues of AVIATION?

♦ ♦ ♦

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♦ ♦ ♦

But We Do Know — that each of these requests indicates a reader has "missed" just the issue he could make valued use of.

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\$1325 F. A. T. "THE CUB" — TAYLORMADE

High cost, high initial cost, operating, have kept many intended buyers from buying airplanes. "The Cub" solves this important problem—it is a real airplane, after all.

Look at flying fields for planned business man and purchased. "The Cub" is the answer to the question of "How can I spend less than 20 m.p.h. and the considerably about ten at takeoff" make it possible to use a small clearing in fields for landing purposes?

Rate of flying accidents has been sufficient reason to ban the "plane as a means of travel" from the public's mind. Here again "The Cub" does away with these fears. "Cubs" are in service from Ottawa to Daytona Florida, used largely for student

instruction; there has never been a motor producing in the U. S. another "Cub" has been on the market.
Every "Cub" we have turned out is in active service except just now this was turned out while warming up a Field in New York City.
Greatest consumption is only 1/16 gal.
per hour.
Maintenance is low.
Delivery charges are little.
Excellent Vision.
Continental A-40 engine.
A.T.C. No. 485.
Flyway Field price \$1325.
Send for complete details.

TAYLOR AIRCRAFT COMPANY
BRADFORD, PA.



*Look for
STABILITY
in your school as
you would in your
plane*

BOEING SCHOOL of Aeronautics is a ~~newly~~ recently established institution. It was created to meet the need for highly trained pilots and mechanics that must accompany the continued development of air-mail flying and passenger transport.

This school is a division of United Aircraft and Transport Corporation—a part of the same system that includes United Air Lines (flying 35,000 miles daily), Pratt & Whitney, the Boeing Company, Commercial, Hawaiian Standard, Chicago Vought, Sikorsky and other companies which represent the ~~stability~~ of stability of aviation products and operation.

Boeing graduate contestants those of other schools operating today in the record of their employment by important air lines and manufacturers. To become a Boeing graduate means that the highest standards of commercial training developed in America have been successfully met.

For bulletin giving detailed descriptions of courses, entrance requirements, fees, etc., etc., call our and mail the coupon below. Compare Boeing's facilities and facilities with those offered elsewhere before choosing your school.

Next regular enrollment, July 5, 1932.

For more courses in *Aeronautics* and *Engine Mechanics*
offered in the July quarter,

BOEING
SCHOOL OF AERONAUTICS

Subsidiary of United Aircraft & Transport Corp

BOEING SCHOOL OF AERONAUTICS
Room 104, Airport, Oakland, California

Conducted in

- Pratt & Whitney*
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- United Commercial Plan*
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- Boeing Motor Plant*
- Boeing Motor Plant*

Name _____ Age _____
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City _____ State _____

**VISIT OUR NEW
GENERAL OFFICES
DURING THE
NATIONAL
AIRCRAFT SHOW**

Our headquarters are now in Detroit
—at the Municipal Airport. Drop in
and see us during the Show. And if
you don't know about our facilities
for "serving you in the Great Lakes
Region," let us tell you all about them.



Boeing on aircraft *Wright* in our Cleveland Service Station

On your way to the Show stop at our hangars.
We maintain parts depots and service stations at

Detroit, Cleveland, Pontiac, Chicago, Toledo,
Massillon, South Bend and Bay City, with
completely equipped repair shops at Cleveland
and Pontiac. And on major overland jobs we
go anywhere. Ask us for full particulars.

Thompson Aeronautical Corp.
Authorized Wright, Pratt & Whitney, and Kinner Service
DETROIT MUNICIPAL AIRPORT • • TELEPHONE PHOENIX 2200



165 M.P.H.
— *even in 1923 **

This fast-flying, fast-diving Army pursuit ship was the first standard high-powered water-cooled model built in the United States. Because it embodied the famous Boeing stamina and anticipated a number of future developments, several are still in service — another instance of Boeing construction years ahead of its time. Boeing Airplane Company, Seattle, Subsidiary United Aircraft & Transport Corporation.

*** BOEING**
*has always built
to-morrow's airplanes
TO-DAY*





Wings for Everybody

... the vibrant song of a motor overhead—bright wings flashing against the sky and vanishing into the distance ... Does the sight leave you feeling "deserted"? Do you long to be in the pilot's seat? You can!

Flying, since the advent of the new Heath, has become everybody's privilege. For sport, business, or training, the Heath is the easiest, most reliable and economical light airplane made. With perfect control, great visibility and low landing speed, the Heath is ideally suited to novice or student pilots. Its small cost of operation makes it popular with the private owner and preferable to the professional operator.

The new Heath can be had either in fly-away or in knock-down form, and when assembled from the Heath K-D kit, is eligible for a Department of Commerce license.

This government approved airplane, the latest in modern design, superbly finished, sturdy and trim, can be yours on remarkably easy terms. Write today for more information and illustrated booklet.

PERFORMANCE
For ten consecutive years
Heath planes have taken first
place in the National Air
Races, and now hold the
most trophies awarded in
their class.

Model LN-2 Flyaway \$1004
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Heath K-D Engine ... \$80
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Send for 10-page catalog for full information on Heath Planes,
Heath K-D and Heath Flying Kits.

86
87

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are made possible by the dependability and safety of good materials ...

... B-G-R VALVE SPRINGS add extra safety to motor performance

... *Our Tools for Flying Safely*

BGR

COOK SPRING DIVISION
BARNES-GIBSON-RAYMOND INC.



YOU KNOW HOW TO BUILD AIRPLANES

WE KNOW HOW TO
MAKE AIRPLANE TUBING

**The OHIO
SEAMLESS TUBE CO.**
Shelby, Ohio



Enforce Safety at Your Airport

Safety is a key word to the aviation industry. On safety depends the approval of the public. Safety often makes the difference between profit and loss. Cyclone Fence protects both fliers and spectators and plays a delicate part in the rating of airports. It enforces ground safety.

It keeps out the curiosity seeker as well as the thief. It allows free ground maneuver and safe outside storage.

Special aviation gates have been designed by the Cyclone Fence Company to meet all requirements of the industry.

Fence manufactured and erected by Cyclone Fence Company has proven its value for years to leading manufacturers and airports.

Tell us your requirements and let us submit an estimate of the cost.

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General Office: Winona, Ill.
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**Quicker
and more
Economical**

Aircraft Assembly with
Hartshorn Tie Rods

SQUARE SECTION TIE RODS can be adjusted with the wrench applied at any point along the rod. Tight corners are no longer troublesome. The flat faces permit making rods at all intersecting angles. A glaze along the rods shows up even the slightest movement since, so there's no danger of twisted, weakened rods.



Brace my ship you bold as fly with

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TITEFLEX
FLEXIBLE
ALL METAL
FUEL LINES



Titaflex approved by the Department of Commerce for fuel lines on licensed aircraft.

Titellex has been successfully used in aircraft construction for sixteen years.

Titeflex absorbs vibration within its own structure, eliminating possible broken fuel lines



Centrifuges in the U.S. Navy

Titeflex Metal Hose Co.

500 Frelinghuysen Ave.

Newark, N. J.

ALPHABETICAL INDEX

This table is presented as a contribution to the study of the nature of the various forms of the disease, but it does not purport to represent the entire number of cases.

AVIATION
April, 1931

AVIATION
and PIRATE

Out Goes COCKPIT REFERENCE THERMOMETERS



The Western Engine Temperature Indicator automatically compensates for "cold-end" or cockpit temperature. No corrections . . . no calculations. Eliminating guess-work — it reliably and accurately keeps the pilot informed of actual engine temperature — cutting maintenance and fuel costs . . . saving time and money.

Installation and maintenance is simple, easy. The new advanced design **W** exton standard copper constantan leads are uniform in resistance irrespective of length. They are flexible, light in weight, small in diameter. Both indicators and leads are inter-changeable. The new **W** exton Enameled Temperature Indicator—designed especially to withstand the severe service of aircraft use—is backed by **W** exton's forty-three years' experience as the world's leading electrical instrument manufacturers.

WESTON TACHOMETERS
the Standard for Aircraft

OUTSTANDING FEATURES

4. Indicate you 100% support over \$100,000 note.

5. Indicate that unaffected by vacation etc.

6. Fully disclosed to prevent confusion with negative comments in article.

WESTON

ELECTRICAL INSTRUMENT CORP.

CHIETI AND L'ABRUZZO 199

- 1. **Direct**—degrees Fahrenheit
- 2. **Analogic**—for “circular” variations
- 3. **Induction** and **Resonance** leads to magnetic fields—an adjustment
- 4. Designed to withstand severe service
- 5. Easy to install—size is flexible, small diameter, light weight.
- 6. Ease to check calibration
- 7. Non-magnetic stainless steel case
- 8. Standardized to operate synchronously with magnetic compass
- 9. Mounting plates allow to indicate
- 10. Light—only 19 mmces
- 11. Coupling for speech output, cylinder base or flange mounting.
- 12. Mounting reduced to a minimum.

The FAIRCHILD 24



A Newcomer in the famous FAIRCHILD line

A SIDE BY SIDE, ALL-WEATHER PLANE FOR
SAFE, ECONOMICAL TRAINING AND * * * * *
PLEASURE FLYING * * * * *

The new two-place Fairchild 24 has been specifically designed to meet the demand for profitable training and economical pleasure flying. High performance has been achieved yet it is easy and safe to fly.

Thus far more than ever before airplane will be sold on a basis of demonstrable value and safety like the popular Fairchild 22 the "24" meets these qualities. Compare it—fly it—you will agree that choice of the Fairchild 24 is a real investment in satisfying performance and economical operation.

The new "24" has side by side dual controls. V-type windshield, inverted radial engine, and a unique wing design gives maximum all round vision—a wide trend leading gear that does not foul the ground when landing. The shock absorbers designed and built by Fairchild prevent jarred wheels and landing jolts. Compound landing gear with self-centering landing gear extending the full length of the effective wing span.

TO DEALERS: We offer a simple and profitable plan. We can show

THE FAIRCHILD 24

Wings	Open biplane
Top Speed	115 MPH
Cruising Speed	85 MPH
Ground Speed	80 MPH
Wing Span	41' 6"
Wing Area	180.00
Wing Load	1.00
Power	FA 220-1000
Power Weight	15.0 LBS./H.P.

A motor of arbitrary type
consideration can be allowed

AVIATION (April 1932)

The new "Model A" WACO is designed primarily for the private owner, being built for comfort rather than for speed, and embodying many exclusive features of practical utility. Power range 100 h.p. to 210 h.p., with corresponding price range \$3585 to \$4895. Write for details and specifications.



THE WACO LINE FOR 1932 includes seventeen standard production models in four designs: ① the new two-place side-by-side "Model A", which incorporates many unique features that make it the ideal airplane for the private owner; ② a refined edition of the four-place cabin "Model C" which was brought out last year; ③ a broadened power range in the famous "Model F-2" open-cockpit biplane; ④ a continuation also of the popular "Model F" three-place general purpose ship. • The WACO offering for the current year contains no "freak" innovations, no unconventional designs of doubtful value, but embodies simply a continued refining and improvement of America's leading make of airplanes. • Write for the evidence, or see the WACO display at the Detroit show. The WACO Aircraft Company, Troy, Ohio.



WACO
AIRCRAFT
COMPANY

WACO's famous three-place open ships (the Models F and F-2) are continued, with a wider range of power plants offered. The brilliant cabin "Model C" with further refinements and increased power, has less than \$4000 completely equipped, flyaway. Like every WACO, it will take-off and land in 25% less space than any other airplane. That is WACO's extra factor of safety!

FAIRCHILD AIRPLANE SALES CORP.

373 West 38th St., New York
DIVISION OF FAIRCHILD AVIATION CORP.
Factory: Hagerstown, Maryland

WACO LEADS IN AIRCRAFT REGISTRATIONS



A good start

There's something about a good start that gives added confidence in any venture. It is particularly significant to the air pilot.

Eclipse Aviation Starters have given this good start to pilots for a great many years. Most flights originate with the sure action of Eclipse Aviation Starters and Generators.

This record has nothing to do with luck. Dependability and reliability are built into Eclipse Products at the factory.

ECLIPSE AVIATION CORPORATION

(Subsidiary of Bendix Aviation Corporation)

East Orange, New Jersey

